

PA89-206221

Superfund Record of Decision (EPA Region 5): Allied Chemical/Ironton
Coke Site, Ironton, Ohio (Second Remedial Action) September 1988

(U.S.) Environmental Protection Agency, Washington, DC

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Superfund Record of Decision:

Allied Chemical, OH

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REPORT DOCUMENTATION PAGE		1. REPORT NO. EPA/ROD/R05-88/078	2.	3. Recipient's Accession No. PB89 2062217AS
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15. Supplementary Notes			13. Type of Report & Period Covered 800/000	
16. Abstract (Limit: 200 words) The Allied Chemical site is located in the City of Ironton, Lawrence County, Ohio. This remedial action addresses the Goldcamp Disposal Area (GDA) operable unit of the site. The other operable unit, comprised of the coke plant, lagoons, and the tar plant, is addressed in a separate remedial action. The GDA is a four-acre disposal pit located in a mixed industrial/ business/residential area bounded by Third Street on the east and the Ohio River on the southwest. Several businesses and institutions are within 100 feet of GDA. Allied Chemical and Dye Company has owned the property since 1955. The GDA was a sand and gravel pit used for disposal of various chemical wastes from three sources between 1945 and 1977. The wastes include: anthracene residue, anthracene salts, phthalic anhydride residue, and miscellaneous process wastes from the Tar Plant; foundry sand containing heavy metals, phenolics, and oils from the Dayton Malleable Iron Company; and wastes disposed of by the Goldcamp Gravel Company. In 1977, Allied decided to discontinue use of the GDA for disposal of chemical wastes. Allied and its contractor, in consultation with the Ohio Environmental Protection Agency (OEPA), completed a closure project at the site in August 1980, which involved removal of standing liquids and filling and capping the site with clay. Subsequent hydrogeologic and water quality investigations indicated that there is ground water contamination at (See Attached Sheet)				
17. Document Analysis a. Descriptors Record of Decision Allied Chemical, OH Second Remedial Action - Final Contaminated Media: gw, soil Key Contaminants: inorganics (cyanide), metals, organics (PAHs, phenols), VOCs (benzene) b. Identifiers/Open-Ended Terms c. COSATI Field/Group				
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		20. Security Class (This Page) None		22. Price

cont. from p. 1

16. ABSTRACT (continued)

the site which may pose a threat to public health through migration. The volume of the disposal area is approximately 300,000 yd³. In addition to this primary area of contamination, there is a zone of nonaqueous-phase contaminants which have migrated through the aquifer to the underlying impermeable bedrock layer. The extent of the contaminated area is uncertain, but the volume is estimated to be 156,000 yd³. The surface of the GDA is also a source of contamination because many substances have oozed up through the existing cap. The primary contaminants of concern affecting the soil and ground water are VOCs including benzene, other organics including phenols and PAHs, and inorganics including cyanide.

The selected remedial action for this site includes: ^{are} construction of a slurry wall around the disposal area from ground surface into the low permeability bedrock; installation of a multi-media RCRA cap over the surface of the disposal area; extraction and onsite treatment of ground water from inside and outside the containment system; provision of an alternate water supply for the Iron-ton Iron Company until ground water cleanup levels are met; imposition of deed restrictions to limit future uses of the property; and preparation of a supplemental RI/FS to identify the extent and nature of the nonaqueous-phase contaminant layer with implementation of the Agency-approved remedy for this contamination, if different from the present containment alternative. The estimated present worth cost for this remedial action is \$13,130,000 with annual O&M costs of \$515,000 for approximately 30 years.

i.a

DECLARATION FOR THE RECORD OF DECISION

Site Name and Location

Allied Chemical/Ironton Coke Site
Ironton, Ohio

Statement of Basis and Purpose

This decision document presents the selected remedial action for the Goldcamp Disposal Area Operable Unit of the Allied Chemical/Ironton Coke site, in Ironton, Ohio, developed in accordance with CERCLA, as amended by SARA, and, to the extent practicable, the National Contingency Plan. This decision is based on the administrative record for this site. The attached index identifies the items that comprise the administrative record upon which the selection of the remedial action is based.

The State of Ohio has concurred on the selected remedy.

Description of the Selected Remedy

This remedial action is the final action for the Goldcamp Disposal Area operable unit, which is one of two operable units for the site. This operable unit addresses a discrete waste disposal area, called the Goldcamp Disposal Area, and ground water contamination associated with the disposal area. The remedy addresses the principal threats posed by the Goldcamp Disposal Area by extracting and treating contaminated ground water which has migrated from the disposal area and by isolating and containing the waste disposal area as a future source of ground water contamination. The second operable unit involves remediation of the other discrete portion of the site which includes the coke plant, tar plant, and lagoon areas and soil, sediment, and ground water contamination associated with those areas.

The major components of the Goldcamp Disposal Area remedy include:

- ' Construction of a low permeability slurry wall around the disposal area from ground surface into the low permeability bedrock.
- ' Installation of a multi-media RCRA-compliant cap over the surface of the disposal area.
- ' Continuous extraction and on-site treatment of ground water within the containment system.
- ' Extraction and on-site treatment of contaminated ground water outside the containment system until cleanup standards are achieved.
- ' Municipal water hook-up for in-plant potable and sanitary uses at Ironton Iron Inc. until ground water contaminant levels meet specific ground water cleanup standards.

- ' Deed restrictions to limit future uses of the property on which the disposal area is located.
- ' Preparation of a supplemental remedial investigation and feasibility study to identify the extent and nature of a secondary source of ground water contamination (non-aqueous phase substance layer) and to develop and evaluate remedial alternatives for the secondary source, and implement the Agency approved NAPS remedy, if different from the present containment alternative.

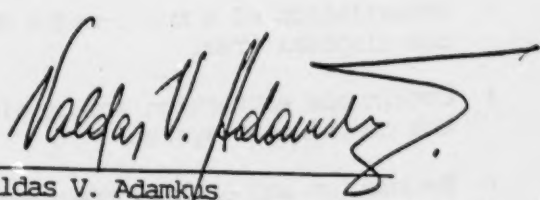
Declaration

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate to the remedial action, is consistent, to the extent practicable, with the NCP, and is cost effective. This remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable. Portions of this remedy satisfy the statutory preference for remedies that employ treatment that reduce toxicity, mobility, or volume of contaminants as a principal element. A principal threat at the site, ground water contamination, will be addressed through treatment which permanently and significantly reduces the toxicity, mobility, or volume of the existing ground water contamination. However, another threat, the disposal area itself, will be addressed through containment rather than treatment. Because of the disposal area size; the fact that there are no on-site hot spots representing major sources of contamination; the difficulties in implementing an excavation and treatment remedy; and the high cost of incineration, it is not practicable to excavate and treat the disposal area.

Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted no less than once every five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Date

9/29/88


Valdas V. Adamkus
Regional Administrator
U.S. EPA, Region V

DECISION SUMMARY

I. Site Name, Location, and Description

The Allied Chemical/Ironton Coke site is located in the City of Ironton, Lawrence County, Ohio (Figure 1). The site is comprised of the area occupied by the coke plant and lagoons, the Tar Plant, and the Goldcamp Disposal Area (Figure 2). The site has been divided into two operable units, one to address the coke plant, lagoons, and the Tar Plant areas, and the other to address the Goldcamp Disposal Area (GDA). This Record of Decision addresses the GDA operable unit of the site.

The Goldcamp Disposal Area is an approximately 4 acre disposal pit which extends nearly 40 feet down from ground surface. The GDA is presently covered with soil and secured from public access by a fence.

The GDA is located in a mixed industrial/business/residential area of Ironton. It is bounded on the east by Third Street and on the southwest by the Ohio River. The GDA is not located in a floodplain. Several businesses and institutions are within 100 feet of the GDA. The ground water near the GDA occurs in the alluvial sand and gravel aquifer and discharges to the Ohio River. The ground water is of potable quality. According to city officials, private residents use municipal water which is drawn from the Ohio River. The City of Ironton water intake is approximately 1.8 miles downstream from the GDA. The nearest ground water user is Ironton Iron Inc., located approximately 1000 feet north of the GDA.

The major surface water body in the area is the Ohio River. The Ohio River is used extensively for transportation, drinking water, and recreation. The Ohio River is also used for the discharge of treated industrial and municipal waste.

II. Site History and Enforcement Activities

A. Operational History:

The GDA, a former sand and gravel pit, was used for disposal of Tar Plant process chemical wastes during the period of 1945 to 1977. The disposal site received wastes from three sources during its operational history. The wastes included:

- Anthracene residue, anthracene salts, phthalic anhydride residue, and miscellaneous process wastes from the Tar Plant. The distillation bottoms from the production of phthalic anhydride from naphthalene are a listed hazardous waste (K024) based on phthalic anhydride and 1,4-naphthoquinone content.

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FIGURE 1

SITE LOCATION MAP

PREPARED FOR

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 MORRISTOWN, NEW JERSEY

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 CORPORATION

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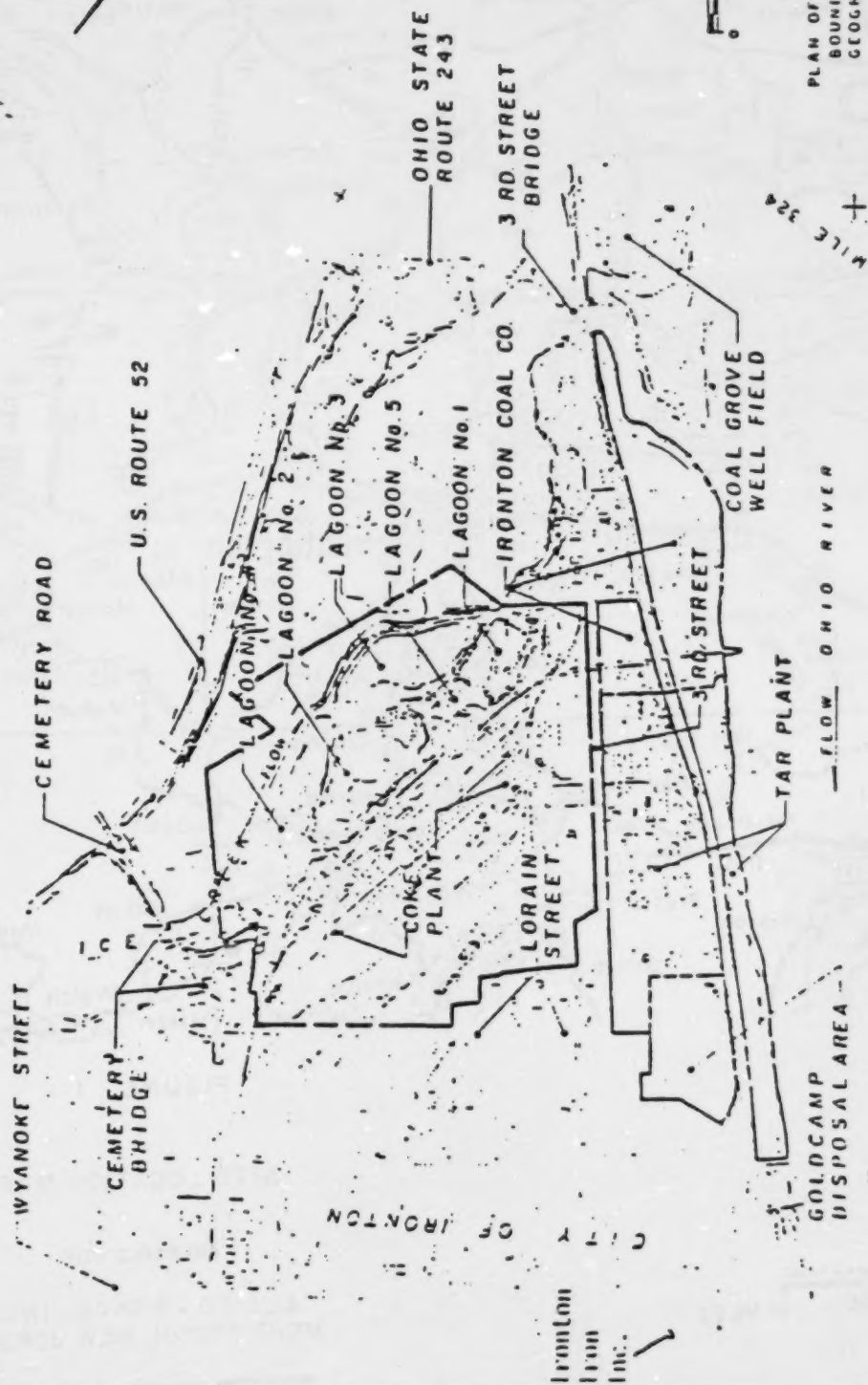


FIGURE 2

PLAN OF PROJECT AREA, SITE
BOUNDARIES AND MILE
324 GEOGRAPHIC LOCATIONS

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

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- Foundary sand from Dayton Malleable Iron Company (now the location of Ironton Iron, Inc.) containing heavy metals, phenolics, and oils.
- Wastes disposed by the Goldcamp Gravel Company.

The GDA was originally two tracts of land: 11.63 acres were originally owned by Marting Iron and Steel Company, which was sold to Margaret V. Goldcamp on December 5, 1938, and 0.04 acre adjacent to Third Street originally owned by Ashland Iron and Bridge Company, which was sold to Henry I. Goldcamp on August 8, 1943 (Title Insurance Company of Minnesota, 1955). Allied Chemical and Dye Company signed an option agreement for the disposal site on March 30, 1955 (Wallum, 1982) and later purchased the property in June 1955 (Property Deed, 1955).

In 1977, Allied decided to discontinue use of the GDA for disposal of chemical wastes and to remove the ponded water, dispose of it using an outside disposal company, and cover the remaining waste.

Allied and its contractor in consultation with the Ohio Environmental Protection Agency (OEPA) developed a plan for closure of the GDA. The closure included, removal of standing liquids and filling and capping of the site with clay.

The closure of the GDA began with the water removal in the late spring of 1979. The filling operation began in November 1979 but was suspended due to weather conditions on December 21, 1979 and resumed in May 1980. The disposal site closure project was completed in August 1980.

B. CERCLA Removal Activities:

The U.S. Environmental Protection Agency (U.S. EPA), under authority of CERCLA or the Superfund Act, assigned the Allied Chemical/Ironton Coke site in Ironton, Ohio to its National Priorities List (NPL) of hazardous waste sites in September 1983. The assignment of this site to the NPL was made at the request of the OEPA, based on results of several hydrogeologic and water quality investigations conducted at the site during the period from 1978 to 1983. The results of these investigations indicated that ground water contamination exists at the site and through migration may pose a threat to the public health, welfare, and environment. The site was No. 167 on the original NPL.

In August 1983, D'Appolonia Waste Management Services, Inc. (acquired by IT effective March 1984), was retained by Frost and Jacobs for

Allied to design and implement a remedial investigation/feasibility study (RI/FS) for the Ironton Coke site. A site assessment was performed in October 1983 by IT prior to initiation of the RI/FS. This assessment highlighted potential contamination problems based on a compilation, review, and evaluation of existing site-specific data. The RI was then designed on the basis of the results of the completed site assessment and in accordance with guidelines specified by the U.S. EPA and OEPA. Phase I of the RI was initiated in late October 1983. During discussions with the U.S. EPA and OEPA in November 1983, the scope of work for the RI/FS was modified and expanded. At that time, the contract with Frost and Jacobs for completion of the RI/FS was transferred to Allied Corporation (Allied).

Negotiations between Allied, U.S. EPA, and OEPA continued during the period in which IT conducted Phase I of the RI (October 1983 to April 1984) and culminated on April 13, 1984 with the signing of an Administrative Order on Consent. The Order required Allied to complete the RI and perform the FS in accordance with the RI/FS work plan approved by the U.S. EPA and OEPA. The work plan was incorporated at Exhibit A of the Order.

A report of the initial site assessment and the Phase I RI was submitted to the U.S. EPA and OEPA in April 1984. Review of these submittals and discussion of the details of the Phase II RI work plan occurred between April and June 1984. IT conducted the Phase II field investigations between mid-June and mid-October 1984 and completed the draft RI report in February 1985. Subsequent to review and evaluation of the draft RI report, the final RI report was submitted in July 1986 (IT, Final Report - Remedial Investigation, July 1986). Phase I and II RI activities included surface and subsurface soil sampling, ground and surface water sampling, waste characterization, surface geophysical testing, limited air sampling, and extensive ground water modeling.

After completion of the RI, a decision was made between the U.S. EPA, OEPA, and Allied to subdivide the Ironton Coke site into two operable units during the development of the FS documents. The two operable units have been identified as the Goldcamp Disposal Area (GDA) and the Coke Plant/Lagoon Area (CPLA). The GDA operable unit includes the disposal area itself and all other areas which have been impacted by the disposal area. The CPLA operable unit includes the remainder of the site and all other site-impacted areas outside of the influence of the GDA. The GDA FS was completed in August 1988..

In addition to the two operable units, Allied is conducting a removal action under an Administrative Order on Consent signed in March 1987 by U.S. EPA, OEPA and Allied. The Order provides for the removal of tanks and their contents located on the coke plant portion of the site.

C. CERCLA Enforcement Activities:

Allied Signal conducted the site RI and GDA FS in accordance with an Administrative Order on Consent between Allied, U.S. EPA, and OEPA. Allied continues to conduct the FS for the CPLA operable unit under the same April 1984 Order.

Allied is also conducting a removal action at the coke plant portion of the site in accordance with a March 1987 Consent Order between Allied, U.S. EPA, and OEPA.

U.S. EPA sent special notice letters for the GDA remedial action to Allied-Signal (as owner/operator and generator) and Amcast Industrial Corporation (as generator) on August 8, 1988. A 60-day moratorium on remedial action commenced upon receipt by Allied and Amcast of the special notice letter.

If U.S. EPA receives a "good faith" proposal within the 60-day period, the moratorium will be extended an additional 60 days.

III. Community Relations History

U.S. EPA and OEPA have conducted the community relations activities at the site. Several fact sheets have been distributed to keep the community informed of the site activities. A public meeting was held in December 1986 to present the findings of the Remedial Investigation.

In accordance with CERCLA Section 113, U.S. EPA published a notice in a local newspaper the week of August 1, 1988 announcing the availability of the GDA FS and Proposed Plan, the date and time of the public meeting, and the duration of the formal public comment period. The announcement also included a brief analysis of the proposed plan and alternative plans that were considered.

A reasonable public comment period of more than the 21 days required by the NCP was established from August 8 to September 6, 1988. A public meeting was held on August 16, 1988 at the Ohio University, Ironton campus in accordance with CERCLA Section 117. A transcript of that meeting is contained in the Administrative Record for the GDA Operable Unit. The Responsiveness Summary contains a response to each of the significant comments, criticisms, and new data submitted in written or oral presentations. This Record of Decision serves as the statement of the basis and purpose of the selected action for the GDA.

IV. Scope and Role of Operable Unit

The GDA is one of two operable units for the Allied Chemical/Ironton Coke site. The other operable unit addresses the coke plant, lagoon, and Tar Plant areas of the site and the areas contaminated by these portions of the site. Because the GDA is a discrete disposal area separate from the coke plant/lagoon areas and has different migration pathways and receptors, Allied, U.S. EPA, and OEPA agreed it was best to study the potential GDA remedial alternatives separate from the other portions of the site.

The GDA is a major portion of the site. The ground water is the main contaminant migration pathway of concern at the GDA and therefore, migration of contaminated ground water is a principal threat at the GDA.

V. Summary of Site Characteristics

The GDA is a former sand and gravel pit used for the disposal of hazardous substances from the Tar Plant and a nearby iron foundry. The disposal area is located within an approximately 80-foot layer of sand and gravel alluvial material. Ground water is found in the sand and gravel unit from about 35 feet beneath ground water surface to 80 feet (bedrock level). The bottom of the GDA is approximately 40 feet beneath ground surface. In 1961, the Greenup Dam was constructed on the Ohio River raising the river level, and hence, the ground water table. This water level rise caused the ground water level to be elevated above the bottom of the GDA wastes. Figure 3 depicts the present subsurface conditions at the GDA.

Ground water in the sand and gravel unit moves west toward the Ohio River with a northerly component toward the pumping Ironton Iron Inc. production wells located approximately 1000 feet north of the GDA. The sand and gravel aquifer is underlain by competent, relatively impermeable bedrock.

As part of the RI, monitoring wells and soil borings were installed near and through the GDA to determine the site characteristics. Figure 4 depicts the location of the sampling points. Tables 1, 2, and 3 indicate contaminant levels found in the soil and ground water at the referenced locations. The contaminants of concern are benzene, phenolics, naphthalene, polynuclear aromatic hydrocarbons (PAHs), cyanide, ammonia, sulfide, and chloride. The RI Report should be referenced for a full discussion of site characteristics.

Midway through the FS, additional field work was conducted to collect information for refinement of the remedial alternatives under consideration. Soil samples were collected and analyzed from Borings

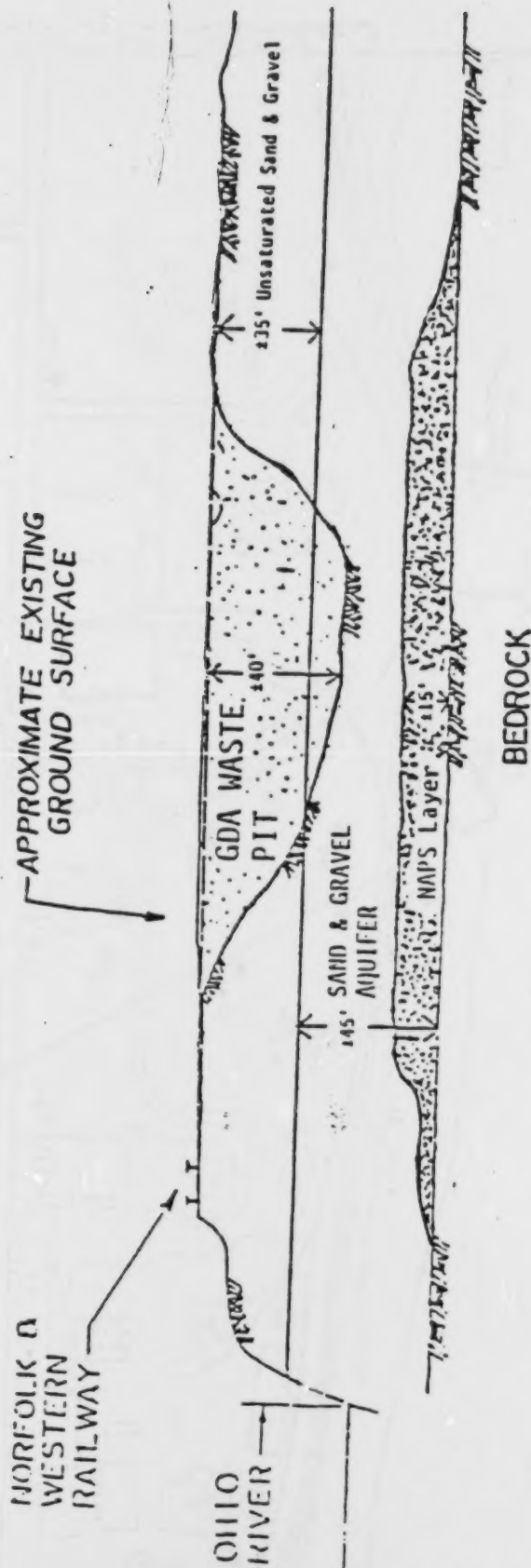


Figure 3
GDA Subsurface
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Two of C Corporation
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 2. 1000-1000, 1000, 1000, 1000

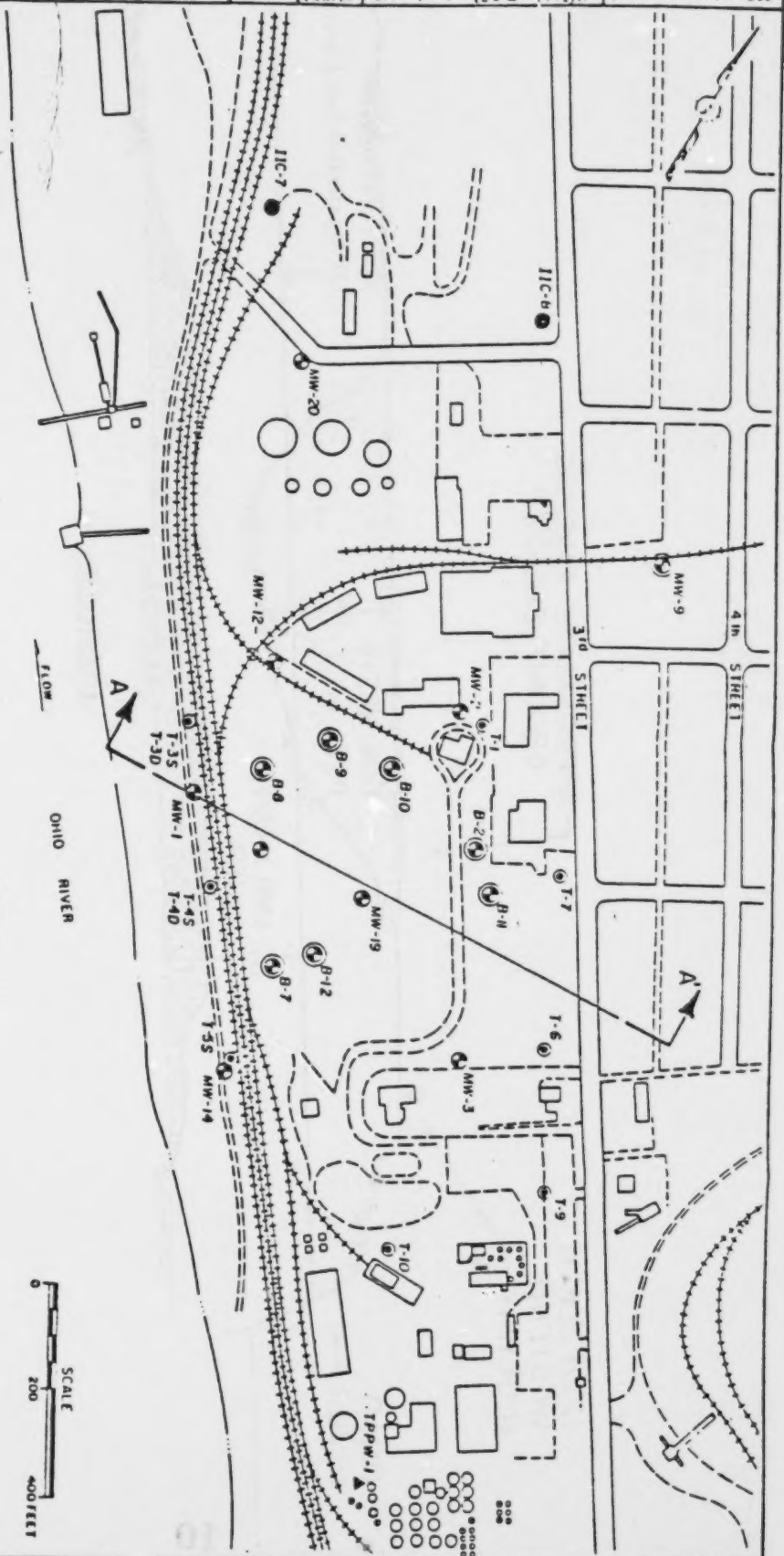
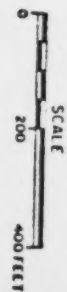
- NOTES:
1. MW-6 IS 1900 FEET NORTHEAST OF MW-2.
 2. SEE FIGURE 1-A FOR SECTION A-A'

- LEGEND
- MW-2 COLDCAMP DISPOSAL AREA MONITORING WELLS
 - IIC-7 IRONTON IRON CORPORATION PRODUCTION WELLS
 - T-1 TAR PLANT GROUND WATER MONITORING WELLS
 - ▲ TTPW-1 TAR PLANT PRODUCTION WELL
 - #1 BORINGS

FIGURE 4
 PLAN AND LOCATION OF SITE
 MONITORING WELLS AND BORING

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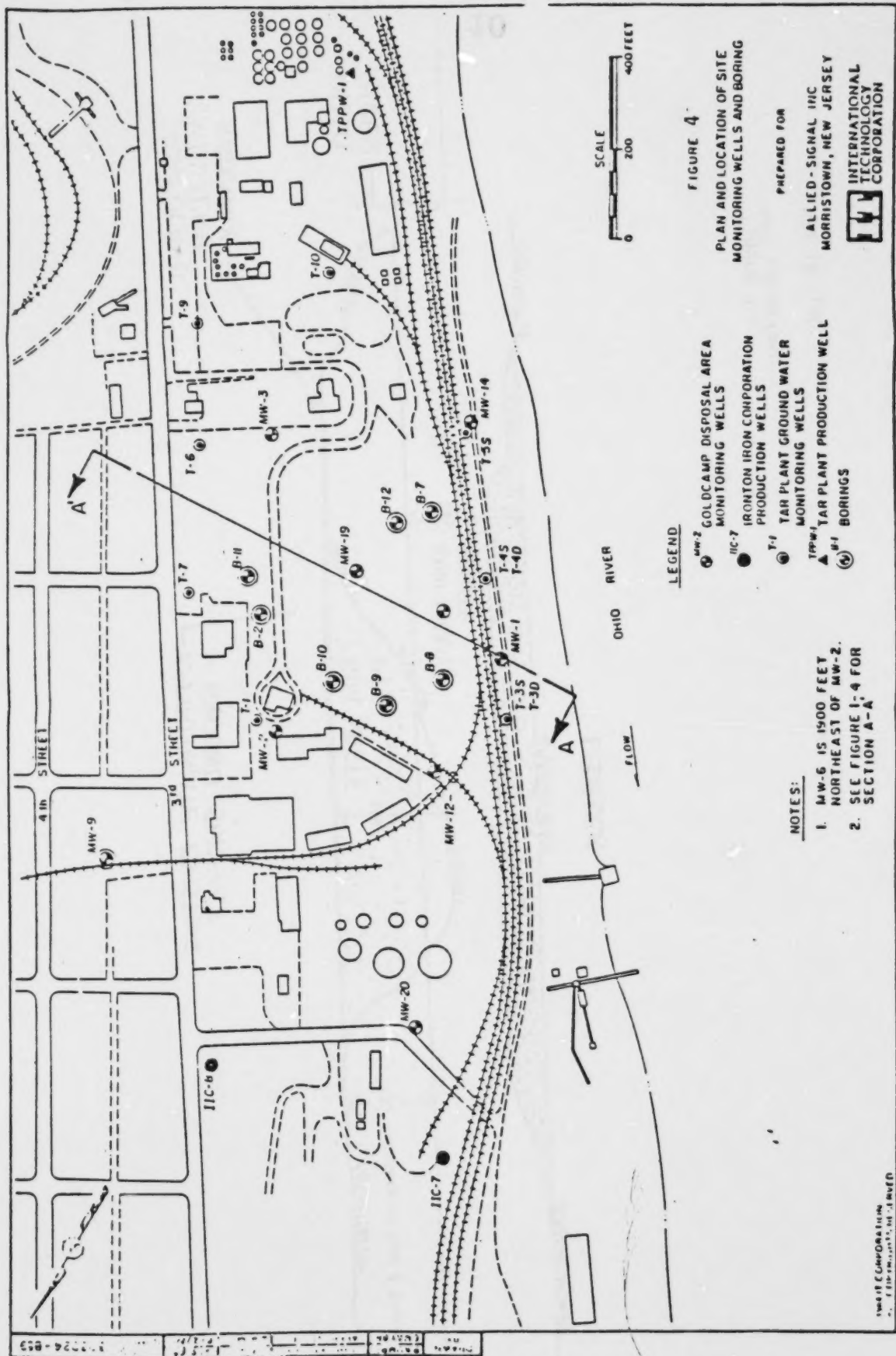


TABLE 1

SAMPLE NO.	DEPTH OF SAMPLE (ft)	TOTAL CYANIDE (mg/kg)	PHENOLICS (mg/kg)	BENZENE (mg/kg)	NAPHTHALENE (mg/kg)
MW-1G-S	18.5-20.0	ND	ND	ND	<1.0
MW-1H-S	28.5-30.0	0.59/ND	0.32	ND	<1.0
MW-1I-S	72.5-73.0	1.3	0.68	0.18	1.2
MW-2G-S	18.5-20.0	ND	1.2	ND	<1.0
MW-2H-S	39.0-40.5	5.2	0.70	ND	ND
MW-3G-S	19.0-20.5	ND	0.90/0.95	ND	<1.0
MW-3H-S	44.0-45.5	1.2	0.28	ND	ND
MW-3I-S	86.0-86.5	ND/ND	ND	ND	<1.0/<1.0
MW-12G-S	18.5-20.0	ND	1.4	ND	ND
MW-12H-S	43.5-45.0	ND	0.31	ND	<1.0
MW-12I-S	79.0-79.8	ND	0.48	ND	<1.0

Note: The "S" in the sample identification indicates "soil" sample.

TABLE 2

SAMPLE NO.	ANTHRACENE (ug/l)	BENZO(a)ANTHRACENE (ug/l)	CHRYSENE (ug/l)	NAPHTHALENE (ug/l)	PHENANTHRENE (ug/l)
<u>North End</u>					
MW-1H-W	ND	ND	ND	ND	ND
MW-1I-W	<10	ND	ND	ND	<10
MW-1J-W	≤230	ND	ND	1,700	≤230
MW-2H-W	<250	ND	ND	12,400	<250
MW-2I-W	≤500	<14	<14	12,000	≤500
MW-2J-W	≤1,400	≤240	≤240	10,000	≤1,400
MW-12H-W	<35	ND	ND	3,600	<35
MW-12I-W	≤69/≤83	ND/ND	ND/ND	7,500/7,400	≤69/≤83
MW-12J-W	<240	<10	<10	12,000	<240
B-2H	≤16,000	≤6,700	≤6,700	13,000	≤16,000
<u>South End</u>					
T-6H-W	ND	ND	ND	ND	ND
MW-3H-W	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND
MW-3I-W	ND	ND	ND	ND	ND

Note: Water samples were collected at three depths from each well. "H," "I," and "J" in the sample identification indicate increasing depth. The last sample from each well was collected from the bottom of the well at the bedrock aquifer interface.

TABLE 3

SAMPLE NO.	BENZENE ($\mu\text{g/l}$)	ETHYLBENZENE ($\mu\text{g/l}$)	TOLUENE ($\mu\text{g/l}$)	STYRENE ($\mu\text{g/l}$)	o-XYLENE ($\mu\text{g/l}$)
<u>North End</u>					
MW-1H-W	ND/<10	<10/<10	<10/<10	ND/ND	ND/ND
MW-1I-W	ND	ND	ND	ND	ND
MW-1J-W	<10	52	21	<10	58
MW-2H-W	470	440	1,400	480	990
MW-2I-W	750	1,000	2,800	1,000	3,200
MW-2J-W	620	650	3,500	880	1,400
MW-12H-W	3,700	780	24	20	370
MW-12I-W	4,400	660	470	34	410
MW-12J-W	5,600	890	1,000	110	1,800
T-2H-W	18,000	1,900	ND	ND	ND
<u>South End</u>					
T-6H-W	<10	ND	ND	ND	ND
MW-3H-W	ND	<10	ND	ND	ND
MW-3I-W	<10/<10	<10/<10	ND/ND	ND/ND	ND/ND

B-7 through B-12 and from Monitoring Well MW-19 (see Figure 4). The results are presented in Table 4. Ground water samples were collected and analyzed from Monitoring Wells MW-2, MW-3, MW-12, MW-14, MW-19, and MW-20. The results are presented in Table 5. The additional field work confirmed that the ground water below and near the site is contaminated with soluble and relatively mobile compounds and this contamination extends to the Ohio River with a north plume extending to the Ironton Iron Inc. production wells. The Ironton Iron Inc. production well 7 has shown benzene levels from nondetectable to 36 parts per billion (ppb), cyanide from nondetectable to 100 ppb, and naphthalene from nondetectable to 17 ppb.

In addition, soil testing results indicate that the approximately 10- to 15-foot-thick layer on top of the bedrock is contaminated (TPHC 100 to 250 ppm). The intermediate zone between the bottom of the GDA and the lower contaminated zone is only slightly contaminated (TPHC <17ppm). This phenomenon suggests the nonaqueous phase substance (NAPS) contaminants have moved through the sand and gravel aquifer to the underlying impermeable layer. The transport of NAPS is also influenced by its viscosity and surface wetting properties. Contaminants move by capillary action through aquifer media and are attenuated to varying degrees there. This leads to storage of NAPS as droplets that are dispersed within the pores of the aquifer media, even if the bulk of the migrating mass of liquid is removed. These contaminants, in general, are insoluble and relatively immobile.

The extent of the secondary source (NAPS layer) is uncertain. From the information gathered, however, this layer appears not to have migrated a great distance from the boundary of the GDA. The eastern edge of the site is the least well-defined. Shallow layers of contamination have been found above the bedrock in Boring B-11 and MW-3. Bedrock elevations are generally lower towards this side of the site, with higher bedrock contours located in the middle of the GDA area. Therefore, because of the limited data points in this area and the tendency for this separate organic phase to migrate towards low points in the bedrock due to gravity, the exact boundary is presently not known.

The volume of the GDA is approximately 300,000 cubic yards. The estimated volume of the NAPS layer is approximately 156,000 cubic yards.

The surface of the GDA is also a source of contamination because many substances have oozed up through the existing cap and pooled on the surface. Based on calculations in the Endangerment Assessment, the GDA is not a source of significant toxic air releases.

TABLE 4
SOIL ANALYSIS^d
VOLATILE HAZARDOUS SUBSTANCE LIST COMPOUNDS

PARAMETER	CAS NUMBER ^a	SAMPLE IDENTIFICATION									
		B-7, S-12	B-7, S-17	B-9, S-14	B-9, S-15	B-10, S-14	B-12, S-3	B-19, S-10/S-11	B-19, S-20	B-19, ABOUT 75 ^c	
		CONCENTRATION $\mu\text{g}/\text{kg}$ ^b									
Acetone ^c	67-64-1	10	<1,900	110	<45	<8,000/<8,000 ^d	<47	47	<7,500	39	
Benzene	71-43-2	<5.0	1,600	<5.0	25	4,400/6,100	<23	12	11,000	6.8	
2-Butanone	78-93-3	<10	<1,900	<10	<45	<8,000/<8,000	<47	<28	3,100	<10	
Bromoform	75-25-2	<5.0	<940	<5.0	<23	<4,000/<4,000	<23	<14	<1,100	<5.0	
Carbon disulfide	75-15-0	<5.0	<940	<5.0	<23	<4,000/<4,000	<23	<14	2600	7.1	
Carbon tetrachloride	56-23-5	<5.0	<940	<5.0	<23	<4,000/<4,000	<23	<14	<1,100	<5.0	
Chlorobenzene	108-90-7	<5.0	<940	<5.0	<23	<4,000/<4,000	<23	<14	<1,300	<5.0	
Chlorobromomethane	124-48-1	<5.0	<940	<5.0	<23	<4,000/<4,000	<23	<14	<1,100	<5.0	
Chloroethane	75-00-3	<10	<1,900	<10	<45	<8,000/<8,000	<47	<28	<7,500	<10	
2-Chloroethylvinyl ether	110-75-8	<10	<1,900	<10	<45	<8,000/<8,000	<47	<28	<7,500	<10	
Chloroform	67-66-3	<5.0	<940	<5.0	<23	<4,000/<4,000	<23	<14	<1,100	<5.0	
Cis-1,3-dichloropropene	10061-01-5	<5.0	<940	<5.0	<23	<4,000/<4,000	<23	<14	<1,300	<5.0	
Dichlorobromomethane	75-27-4	<5.0	<940	<5.0	<23	<4,000/<4,000	<23	<14	<1,100	<5.0	
1,1-Dichloroethane	75-34-3	<5.0	<940	<5.0	<23	<4,000/<4,000	<23	<14	<1,300	<5.0	
1,2-Dichloroethane	107-06-2	<5.0	<940	<5.0	<23	<4,000/<4,000	<23	<14	<1,300	<5.0	
1,1-Dichloroethylene	75-35-4	<5.0	<940	<5.0	<23	<4,000/<4,000	<23	<14	<1,300	<5.0	
1,2-Dichloropropane	78-87-5	<5.0	<940	<5.0	<23	<4,000/<4,000	<23	<14	<1,300	<5.0	
Ethylbenzene	100-41-4	<5.0	19,000	<5.0	380	8,200/16,000	110	<14	7,200	<5.0	
2-Hexanone	591-78-6	<10	<1,900	<10	<45	<8,000/<8,000	<47	<28	<2,500	<10	
Methyl bromide	74-83-9	<10	<1,900	<10	<45	<8,000/<8,000	<47	<28	<2,500	<10	

See footnotes at end of table.

TABLE 4
(Continued)

PARAMETER	CAS NUMBER ^a	SAMPLE IDENTIFICATION					R-12, S-3	HW-19, S-10/S-11	HW-19, S-20	HW-19, ARJUF 75 ^c
		B-7, S-12	B-7, S-17	B-8, S-14	B-9, S-15	B-10, S-14				
		CONCENTRATION $\mu\text{g}/\text{kg}$ ^b								
Methyl chloride	74-87-3	<10	<1,900	<10	<45	<8,000/<8,000	<47	<28	<2,500	<10
Methylene chloride ^c	74-09-2	<5.0	<940	<5.5	<23	<4,000/<4,000	<23	<14	<1,300	14
4-Methyl-2-pentanone	108-10-1	<10	<1,900	<10	<45	<8,000/<8,000	<47	<28	<2,500	<10
Styrene	100-42-5	<5.0	5,800	<5.0	<23	<4,000/<4,000	<23	<14	<1,300	<5.0
1,1,2,2-Tetrachloroethane	79-34-5	<5.0	<940	<5.0	<23	<4,000/<4,000	<23	<14	<1,300	<5.0
Tetrachloroethylene	127-18-4	<5.0	<940	<5.0	<23	<4,000/<4,000	<23	<14	<1,300	<5.0
Toluene	108-88-3	<5.0	16,000	<5.0	26	9,500/9,500	<23	64	18,000	<5.0
trans-1,2-Dichloroethylene	156-60-5	<5.0	<940	<5.0	<23	<4,000/<4,000	<23	<14	1,600	<5.0
trans-1,3-Dichloropropene	10061-02-6	<5.0	<940	<5.0	<23	<4,000/<4,000	<23	<14	<1,300	<5.0
1,1,1-Trichloroethane	71-35-6	<5.0	<940	<5.0	<23	<4,000/<4,000	<23	<14	<1,300	<5.0
1,1,2-Trichloroethane	79-00-5	<5.0	<940	<5.0	<23	<4,000/<4,000	<23	<14	<1,300	<5.0
Trichloroethylene	79-01-6	<5.0	<940	<5.0	<23	<4,000/<4,000	<23	<14	<1,300	<5.0
Vinyl acetate	108-05-4	<10	<1,900	<10	<45	<8,000/<8,000	<47	<28	5,600	<5.0
Vinyl chloride	75-01-4	<10	<1,900	<10	<45	<8,000/<8,000	<47	<28	<2,500	<10
Total xylenes	95-47-6	<5.0	33,000	8.2	230	16,000/21,000	24	28	<2,500	<10
									20,000	<5.0

^aThe numbers presented in this column are the Chemical Abstracts Service (CAS) numbers used for cataloging the indicated compounds in the Chemical Abstracts Index.

^b $\mu\text{g}/\text{kg}$ = micrograms per kilogram or parts per billion.

^cThe compound is a common laboratory contaminant. Although the method blank has been subtracted, values just above the detection limit should be considered suspect.

^dThe sample was prepared and analyzed in duplicate.

TABLE 4
SOIL ANALYSIS^d
SEMI-VOLATILE HAZARDOUS SUBSTANCE LIST COMPOUNDS

PARAMETER	CAS NUMBER ^a	SAMPLE IDENTIFICATION						CONCENTRATION $\mu\text{g}/\text{kg}$ ^b	MW-19, S-10/S-11	MW-19, S-20	MW-19, ANNUAL 75 ^c
		B-7, S-12	B-8, S-14	B-9, S-15	B-10, S-16	B-12, S-3					
Acenaphthene	83-32-9	<390	<8,300	130,000	340,000	820,000		56,000	<1,200,000	<660	
Acenaphthylene	208-96-8	<390	<8,300	<21,000	<230,000	<440,000		<22,000	<1,200,000	<660	
Anthracene	120-12-7	<390	110,000	36,000	<230,000	1,200,000		520,000	8,500,000	<660	
Benzo(a)anthracene	56-55-3	<390	85,000	40,000	<230,000	<440,000		150,000	<1,200,000	<660	
Benzo(a)pyrene	50-32-8	<390	<8,300	23,000	<230,000	4,400,000		140,000	<1,200,000	<660	
3,4-Benzofluoranthene	205-99-2	<390	<8,300	21,000	<230,000	4,500,000		110,000	<1,200,000	<660	
Benzo(g,h,i)perylene	191-24-2	<390	<8,300	<21,000	<230,000	2,800,000		85,000	<1,200,000	<660	
Benzoic acid	65-85-0	<1,900	<40,000	<100,000	<1,100,000	<2,100,000		<110,000	<15,000,000	<1,200	
Benzo(k)fluoranthene	207-08-9	<390	<8,300	23,000	<230,000	3,300,000		<22,000	<1,200,000	<660	
Benzyl alcohol	100-51-6	<390	<8,300	<21,000	<230,000	<440,000		<22,000	<1,200,000	<660	
Bis(2-chloroethoxy)methane	111-91-1	<390	<8,300	<21,000	<230,000	<440,000		<22,000	<1,200,000	<660	
Bis(2-chloroethyl)ether	111-46-4	<390	<8,300	<21,000	<230,000	<440,000		<22,000	<1,200,000	<660	
Bis(2-chloroisopropyl)ether	39638-32-9	<390	<8,300	<21,000	<230,000	<440,000		<22,000	<1,200,000	<660	
Bis(2-ethylhexyl)phthalate	117-81-7	<390	<8,300	<21,000	<230,000	<440,000		<22,000	<1,200,000	<660	
4-Bromophenyl phenyl ether	101-55-3	<390	<8,300	<21,000	<230,000	<440,000		<22,000	<1,200,000	<660	
Butyl benzyl phthalate	83-68-7	<390	<8,300	<21,000	<230,000	<440,000		<22,000	<1,200,000	<660	

See footnotes at end of table.

TABLE 4
(Continued)

PARAMETER	CAS NUMBER ^a	SAMPLE IDENTIFICATION							MW-19, S-10/S-11	MW-19, S-70	MW-19, ABOUT 75 ^c
		B-7, S-12	B-7, S-17	B-8, S-14	B-9, S-15	B-10, S-14	B-12, S-3	CONCENTRATION $\mu\text{g}/\text{kg}^b$			
4-Chloroaniline	106-47-8	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<22,000	<1,200,000	<660
2-Chloronaphthalene	92-58-7	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<22,000	<1,200,000	<660
2-Chlorophenol	95-57-8	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<22,000	<1,200,000	<660
4-Chlorophenyl phenyl ether	7005-72-3	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<22,000	<1,200,000	<660
Chrysene	218-01-9	<390	<81,000	<8,300	25,000	<230,000	4,200,000	140,000	140,000	<1,200,000	<660
Dibenzo(a,h)anthracene	53-70-3	<390	<81,000	<8,300	<21,000	<230,000	<440,000	36,000	36,000	<1,200,000	<660
Dibenzofuran	132-64-9	<390	250,000	21,000	80,000	240,000	<440,000	31,000	31,000	<1,200,000	<660
1,2-Dichlorobenzene	95-50-1	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<22,000	<1,200,000	<660
1,3-Dichlorobenzene	541-73-1	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<22,000	<1,200,000	<660
1,4-Dichlorobenzene	106-46-7	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<22,000	<1,200,000	<660
3,3'-Dichlorobenzidine	91-94-1	<780	<160,000	<17,000	<42,000	<450,000	<880,000	<44,000	<44,000	<1,400,000	<1,100
2,4-Dichlorophenol	120-83-2	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<22,000	<1,200,000	<660
Diethyl phthalate	84-66-2	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<22,000	<1,200,000	<660
2,4-Dimethylphenol	105-67-9	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<22,000	<1,200,000	<660
4,6-Dinitro-o-cresol	534-52-1	<1,900	<400,000	<40,000	<100,000	<1,100,000	<2,100,000	<110,000	<110,000	<35,000,000	<3,200
2,4-Dinitrophenol	51-28-5	<1,900	<400,000	<40,000	<100,000	<1,100,000	<2,100,000	<110,000	<110,000	<35,000,000	<3,200
Dimethyl phthalate	131-11-3	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<22,000	<1,200,000	<660
Di-n-butyl phthalate	84-74-2	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<22,000	<1,200,000	<660
2,4-Dinitrotoluene	121-14-2	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<22,000	<1,200,000	<660

See footnotes at end of table.

TABLE 4
(Continued)

PARAMETER	CAS NUMBER ^a	SAMPLE IDENTIFICATION							MW-19, S-10/S-11	MW-19, S-20	MW-19, ARHIII 15 ^c
		B-7, S-12	B-7, S-17	B-8, S-14	B-9, S-15	B-10, S-14	B-12, S-3				
		CONCENTRATION $\mu\text{g/kg}$ ^b									
2,6-Dinitrotoluene	606-20-2	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<7,200,000	<660	
Di-n-octyl phthalate	117-84-0	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<7,200,000	<660	
Fluoranthene	206-44-0	<390	510,000	36,000	190,000	420,000	8,100,000	290,000	17,000,000	<660	
Fluorene	86-73-7	<390	240,000	20,000	82,000	<230,000	<440,000	42,000	7,400,000	<660	
Hexachlorobenzene	118-71-1	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<7,200,000	<660	
Hexachlorobutadiene	87-68-3	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<7,200,000	<660	
Hexachlorocyclopentadiene	77-47-4	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<7,200,000	<660	
Hexachloroethane	67-72-1	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<7,200,000	<660	
Indeno(1,2,3-cd)pyrene	193-39-5	<390	<81,000	<8,300	<21,000	<230,000	2,600,000	82,000	<7,200,000	<660	
Isothiuric	78-59-1	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<7,200,000	<660	
2-Methylnaphthalene	91-57-6	<390	390,000	32,000	81,000	300,000	<440,000	39,000	<7,200,000	<660	
2-Methylphenol	95-48-7	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<7,200,000	<660	
4-Methylphenol	106-44-5	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<7,200,000	<660	
Naphthalene	91-20-3	<390	1,100,000	60,000	410,000	1,600,000	<440,000	570,000	28,000,000	<660	
2-Nitroaniline	88-74-4	<1,900	<400,000	<40,000	<100,000	<1,100,000	<2,100,000	<110,000	<15,000,000	<1,200	
3-Nitroaniline	99-09-2	<1,900	<400,000	<40,000	<100,000	<1,100,000	<2,100,000	<110,000	<15,000,000	<1,200	
4-Nitroaniline	100-01-6	<1,900	<400,000	<40,000	<100,000	<1,100,000	<2,100,000	<110,000	<15,000,000	<1,200	
Nitrobenzene	98-95-3	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<7,200,000	<660	

See footnotes at end of table.

TABLE 4
(Continued)

PARAMETER	CAS NUMBER ^a	SAMPLE IDENTIFICATION							MW-19, S-20	MW-19, S-10/S-11	B-12, S-3	MW-19, S-20	MW-19, ABOUT 1/3
		B-7, S-12	B-7, S-17	B-8, S-14	B-9, S-15	B-10, S-14	CONCENTRATION $\mu\text{g}/\text{kg}$ ^b						
2-Nitrophenol	88-75-5	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<1,200,000	<660			
4-Nitrophenol	100-02-7	<1,900	<400,000	<40,000	<100,000	<1,100,000	<2,100,000	<110,000	<35,000,000	<1,200			
N-Nitrosodi-n-propylamine	621-64-7	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<1,200,000	<660			
N-Nitrosodiphenylamine (diphenylamine) ^c	86-30-6	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<1,200,000	<660			
p-Chloro-m-cresol	59-50-7	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<1,200,000	<660			
Pentachlorophenol	87-86-5	<1,900	<400,000	<40,000	<100,000	<1,100,000	<2,100,000	<110,000	<35,000,000	<1,200			
Phenanthrene	85-01-8	<390	800,000	70,000	320,000	960,000	3,900,000	250,000	27,000,000	<660			
Phenol	108-95-2	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<1,200,000	<660			
Pyrene	129-00-0	<390	400,000	27,000	170,000	540,000	5,500,000	330,000	14,000,000	<660			
1,2,4-Trichlorobenzene	170-82-1	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<1,200,000	<660			
2,4,5-Trichlorophenol	95-95-4	<1,900	<400,000	<40,000	<100,000	<1,100,000	<2,100,000	<110,000	<35,000,000	<1,200			
2,4,6-Trichlorophenol	88-06-2	<390	<81,000	<8,300	<21,000	<230,000	<440,000	<22,000	<1,200,000	<660			

^aThe numbers presented in this column are the Chemical Abstracts Service (CAS) numbers used for cataloging the indicated compounds in the Chemical Abstracts Index.

^b $\mu\text{g}/\text{kg}$ = micrograms per kilogram or parts per billion.

^cDetected as compound in parentheses.

^dCompounds listed as "<" were not detected at or above the indicated detection limits. These compounds may or may not be present and if present concentrations below the detection limit are not known.

TABLE 4
SOIL ANALYSIS
TOTAL METALS

SAMPLE IDENTIFICATION		PARAMETER	CONCENTRATION (mg/kg) ^a
BORING NO.	SAMPLE NO.		
MW-19	S-10/S-11 Composite	Aluminum	4,200/3,600 ^b
		Antimony	<6/<6
		Arsenic	4.0/2.9
		Barium	67/61
		Beryllium	<0.06/<0.6
		Cadmium	<0.6/<0.6
		Calcium	4,800/5,000
		Chromium	9/8
		Cobalt	3/2
		Copper	12/12
		Iron	11,000/10,000
		Lead	25/33
		Magnesium	1,100/1,000
		Manganese	190/200
		Mercury	0.1/0.2
		Nickel	9/9
		Potassium	520/460
		Selenium	<0.6/<0.6
		Silver	<1/<1
		Sodium	320/370
		Thallium	<0.6/<0.6
		Vanadium	120/130
		Zinc	67/70

^amg/kg = milligrams per kilogram or parts per million.

^bThe sample was prepared and analyzed in duplicate.

TABLE 5
GROUND WATER ANALYSIS
INDICATOR PARAMETERS

SAMPLE IDENTIFICATION	AMMONIA (mg/l) ^a	CYANIDE (mg/l)	PARAMETERS			NAPHTHALENE CAS NO. 91-20-3 (ug/l)
			PHENOLICS (mg/l)	BENZENE CAS NO. 71-43-2 ^b (ug/l)		
MW-2K	2.0	0.14	0.032	36/48		340
MW-2L	5.2	1.1	0.052/0.049 ^d	45		1,600
MW-2M	26.0	0.16	1.0	420		4,300
MW-3K ^f	0.13	<0.02	<0.005/<0.01	<12		<10
MW-3L ^f	0.09	0.09	<0.005	<25		<10
MW-3M ^f	28.0	0.44/0.24/0.26 ^e	0.018	120		<10
MW-3K	0.63	<0.02	<0.005	<12		24
MW-3L	4.9	0.03	<0.005	13		28
MW-3M	51.0	0.17	0.023	130		<10
MW-12K	8.5/8.5	<0.02	0.19	400		1,600
MW-12L	11.0	<0.02	0.73	75		2,600
MW-12M	16.0	<0.02	1.8	2,600		5,000
MW-14K	<0.05	<0.02/<0.04	<0.005	<12		33
MW-14L	<0.05	<0.02	0.008	<12		12
MW-14M	0.06	<0.02	0.011	<12		14
MW-19K	22.0	0.02/0.02	3.5	1/0		600
MW-19L	18.0	<0.02	1.4	390		200
MW-19M	16.0	<0.02	1.4	240		250

See footnotes at end of table.

TABLE 5
(Continued)

SAMPLE IDENTIFICATION	AMMONIA (mg/l) ^a	CYANIDE (mg/l)	PHENOLICS (mg/l)	BENZENE CAS NO. 71-43-2 ^b (ug/l)	NAPHTHALENE CAS NO. 91-20-3 (ug/l)
MW-20K	0.43	<0.02	<0.005/<0.01	<12	40
MW-20L	1.2	<0.02	<0.005	<12	24
MW-20M	1.4	0.13	<0.005	<12	25
MW-21K	16.0	0.02	3.9	260	360
MW-21L	14.0	<0.02	1.6	390	220
MW-21H	22.0	<0.02	2.0	290	220
MW-22K ^g	<0.05	<0.02	0.041	43	220

^amg/l = milligrams per liter or parts per million.^bCAS No. is the Chemical Abstracts Service number used for cataloging the indicated compound in the Chemical Abstracts Index.^cug/l = micrograms per liter or parts per billion.^dThe sample was analyzed in duplicate.^eThe sample contained a sediment which made it impossible to obtain a homogeneous aliquot; therefore, the sample was analyzed in triplicate.^fSampled before purging.^gField blank (proceeding decontamination of sample pump, deionized water) shows elevated levels of benzene and naphthalene. This indicates that the stipulated cleaning procedure was adequate to cleanse the constituents like ammonia and phenolics, somewhat adequate for benzene, but inadequate for naphthalene. Subsequent to MW-22, Well MW-3 was sampled and the naphthalene levels in this well show much less than MW-22 (~25 high as compared to 200 high). The purging of Well MW-3 was thus adequate to cleanse the sample. In summary, with the exception of the field blank sample, all other results are representative.

VI.. Summary of Site Risks

An Endangerment Assessment was conducted in accordance with the Superfund Public Health Evaluation Manual, October 1986 to determine the baseline risk of taking no action at the site.

The contaminants of concern are benzene, naphthalene, phenolics, PAHs, cyanide, ammonia, sulfates, and chlorides. These chemicals were selected because they are the most prevalent and present a range of carcinogenicity, toxicity, and mobility. The four PAHs selected as indicator chemicals using the process outlined in the Superfund Public Health Evaluation Manual, October 1986 are benzol(a)phrene, benz(a)anthracene, dibenz(a,h)anthracene, and chrysene.

The exposure assessment examined several potential exposure pathways including, ground water, surface water (Ohio River contamination via ground water), soils, and air. The populations potentially at risk include the Ironton Iron Inc. workers (contaminated) ground water, those that use the Ohio River for recreation (surface water, and the closest business, Veterans of Foreign Wars Lodge (air pathway). The site is capped and fenced, so direct contact with the wastes was not considered a major pathway.

The Endangerment Assessment determined that there is a public health risk from present and future use of the contaminated ground water. Recreational uses of the Ohio River do not pose a risk as sampling results did not indicate a significant increase of site related contaminants in the Ohio River downstream of the GDA. The modeling conducted to determine potential air releases indicated there is not a significant risk to public health from the air pathway.

The risks are related to the carcinogenicity of PAHs and benzene. PAHs are strong carcinogens, but are not very mobile. Benzene is not as strong a carcinogen, but is a mobile and volatile compound. The ground water levels determined to be protective for these compounds is 3.1 parts per trillion total PAHs and the benzene Maximum Contaminant Level of 5 ppb.

The environmental risks are from the potential contamination of the Ohio River by contaminated ground water which may result in the bioaccumulation by fish of benzene, naphthalene, phenolics, and PAHs. However, fish tissue data were not available and based on sampling results there is no statistically significant increase in contaminant levels downstream of GDA or a statistically significant difference between up and downstream contaminant levels.

VII. Description of Alternatives

During the FS, numerous technologies were identified and evaluated to address the problems at the GDA. Applicable technologies were then combined to create alternatives for the GDA. The alternatives were evaluated and screened until a sufficient number of viable alternatives were left for the detailed evaluation. Four alternatives were carried through to the detailed evaluation and include no action, an alternative which provides containment and treatment and several alternatives which provide a range of treatment of the GDA wastes.

The four alternatives considered for detailed evaluation are the following:

- Alternative 1 - No Action
- Alternative 2 - Slurry Wall and Cap, Recovery Wells Inside and Outside of Slurry Wall, Ground Water Treatment, Municipal Water Supply for Ironton Iron Inc., and NAPS Investigation
- Alternative 3 - Incineration of GDA Wastes, Slurry Wall, Redisposal and Cap of Incineration Residue, Ground Water Treatment, Municipal Water Supply for Ironton Iron Inc., and NAPS Investigation
- Alternative 4 - Incineration of GDA Wastes and Subsoils, Ground Water Treatment, Municipal Water Supply for Ironton Iron Inc., and NAPS Investigation

The following sections describe the major components of each remedial action alternative. Figure 5 depicts the four alternatives.

A. ALTERNATIVE 1 - NO ACTION

The no-action alternative provides no additional remediation, monitoring, or security activities at the site to further minimize risk to the environment or public health. Any changes to the existing environment will occur only as a result of natural occurrences. This alternative will be considered as a base-line for comparison with other alternatives where remedial actions will be performed.

B. ALTERNATIVE 2 - SLURRY WALL AND CAP, RECOVERY WELLS INSIDE AND OUTSIDE OF SLURRY WALL, GROUND WATER TREATMENT, MUNICIPAL WATER SUPPLY, AND NAPS INVESTIGATION

This alternative is a combination of source control and management of migration remedial actions. The major components of this alternative include the following:

- Constructing a slurry wall encircling the GDA landfill
- Creating an inward ground water gradient within the slurry wall boundaries
- Capping of the GDA landfill
- Treating ground water extracted from inside and outside of the slurry wall at a new treatment facility
- Providing a municipal water hook-up for sanitary/potable use for users of Ironton Iron Inc. (III).
- Monitoring of site ground water
- Securing the site from unauthorized personnel and Deed Restrictions
- NAPS Investigation and implementation of the Agency approved remedy, if different than the present containment alternative.

As part of this alternative, a slurry wall is constructed around the entire perimeter (approximately 2,000 lineal feet) of the disposal area to create an impervious barrier between the waste and surrounding ground and ground water.

The wall extends from ground surface to competent bedrock, approximately 80 feet beneath the site and it is keyed into the bedrock. The approximately 80-foot-deep wall is constructed of soil-bentonite.

The exact location of the slurry wall is determined during a field boring program conducted for purposes of detailed design. Borings are drilled prior to design of the slurry wall to obtain supplemental information on the site subsurface profile and to obtain soil samples for analyses. The borings are placed at approximate 200-foot spacings around the site. The subsurface profiles indicate zones of undesirable backfill materials. The collected soil samples are classified at the laboratory through sieve analyses and Atterberg limits. This information, combined with the subsurface profiles aids in identifying the worst case

condition with respect to permeability. Classification of the site soils also identifies the need for backfill borrow soil in the slurry mix. Based on this information, mixtures of in situ material and bentonite are developed. Short-term permeability testing is performed on selected mixes. By permeating the mixtures with water and varying the percent bentonite and/or percent fines (i.e., borrow or in situ soils) a good indication of actual backfill mixes is obtained. Based on the short-term testing, design mixes are selected for final verification during long-term compatibility testing. During this test, sample mixes are permeated with site ground water and NAPS to simulate 30 plus years of field flow. Additionally, undisturbed samples will be collected along the northwestern side of the site to provide information for a site stability analysis.

Based on IT's experience in designing and constructing slurry walls, a high-level of confidence is attained after the completion of the filter cake and short-term permeability testing program. The long-term permeability tests are then conducted to confirm the short-term results (which indicated that the slurry wall will not undergo chemical breakdown from the worst-case site leachate). At this point (short-term) in the testing/design program, sound conclusions can be drawn with respect to the effectiveness of a particular design soil-bentonite mixture. In the unlikely event that no slurry wall mixtures pass the long-term compatibility tests, a different engineering solution will have to be developed. The design process allows for proper backfill mixture development and long-term permeability testing under worst-case conditions.

Preliminary bentonite compatibility testing has indicated that Federal 90 bentonite is suitable for use at the site. Bentonite is delivered to the site in bulk, flash mixed, and stored in on-site ponds. These ponds provide adequate slurry reserves in the event that high-permeability zones are encountered with resultant high slurry loss.

A preliminary stability analysis was performed to assess the constructibility and stability of a typical soil-bentonite wall if placed adjacent to the active Norfolk and Western Railway line. Analysis indicated that the wall can be constructed if a minimum 40-foot distance is maintained between the slurry wall and the tracks.

The slurry trench cutoff wall is constructed by excavating a narrow trench (usually two to three feet wide) through the pervious layers and keying into bedrock at approximately 80 feet. The trench is excavated with a backhoe and at greater depths with a clamshell. The sides of the trench are maintained from collapsing by keeping the trench filled with the bentonite slurry during excavation and prior to backfilling. To ensure full contact at the bottom of the

excavation with bedrock, the base of the excavation is probed for unconsolidated material, cracks, and potholes using an air lift. Pervious material in natural depressions and sand or sediment that settles out of the slurry, are removed by an air-lift pump. When the sand-slurry mix is blown out of the air-lift pump and onto the bank, the sand settles out and the slurry is drained back into the trench. In many cases, to provide an effective connection between the wall and the rock, the contact between the two is grouted. After the trench has been excavated under a bentonite slurry, a mixture of soil and bentonite is placed in the trench, displacing the bentonite slurry. This backfill material is designed to have a permeability to 10^{-7} cm/s and to be resistant to attack and degradation by the site materials being contained. Assuming the excavated materials provide a suitable backfill, slurry is mixed with the soil on a concrete pad. Additional borrow soils may be necessary for the backfill mix if existing site materials do not provide sufficient fines. A special bulldozer is used to work the material to a smooth consistency. The backfill is then pushed into the trench so that the backfill slope displaces the bentonite slurry forward. The excavation and backfilling activities are phased to make the operation continuous with relatively small quantities of new slurry required to keep the trench full and to mix backfill.

The slurry wall is monitored to evaluate the continuing effectiveness of the wall in the subsurface environment. Potential geotechnical problems that require consideration after a slurry cutoff wall has been installed relate to basal stability, ground movement behind the wall, ground water level and chemistry and surface water chemistry. The selection of the specific monitoring program is dependent upon questions remaining after completion of the detailed design and problems encountered either during or after the construction phase.

A ground water pumping system is installed within the encircled GDA to provide an inward ground water gradient. This will increase the degree of containment afforded by the slurry wall by preventing migration of additional leachate to the outside of the wall. Initially, higher pumping rates are used to lower the water table below the waste. Once this is achieved, the pumping is limited to the amount of seepage through the slurry wall. The pumping system includes two extraction wells and a collection system. The wells are constructed of four-inch-inside-diameter stainless steel casing. Slotted-well screens with a 0.010-inch slot size penetrate the entire saturated thickness of the aquifer. A 2-inch submersible pump is used to pump water from the well through 1/2-inch PVC pipe. Each well extends approximately 80 feet to bedrock. The wells yield a combined a total of 1 gpm of ground water and will maintain lower water levels inside of the slurry wall than on the outside. The wall is designed to withstand the hydraulic gradient

across the wall. The collected ground water is piped to and treated at a new treatment facility constructed on site.

Additionally, the site is covered with a cap which meets standards specified by RCRA. Capping of the site reduces infiltration, thus reducing leachate generation, and limits the potential for human exposure to site constituents via direct contact. The conceptual cap design consists of the following components in their respective installation order:

- ' Gas Venting System
- ' Geotextile
- ' Clay Barrier Layer - Two-foot thickness of compacted clay
- ' Synthetic Liner - 60-mil synthetic membrane
- ' Drainage/Filter Layer - Hydronet/geotextile
- ' Soil Cover - Minimum two-foot thickness of soil

The gas venting system prevents the accumulation of potentially combustible gases beneath the final cover. A layer of granular material is placed over the existing wastes to act as a conduit for the gases. Venting pipes constructed of 6-inch polyethylene are placed at 200-foot centers over the area to be capped. The bottom six inches of this pipe is slotted and is placed within the granular layer. A carbon adsorption unit is attached to each vent pipe to control volatile organics and odors. A layer of geotextile is placed over the granular layer to prevent soil particles from entering and clogging the granular layer.

The clay barrier layer is placed and compacted in six-inch maximum lifts and has a design permeability of 1×10^{-7} cm/s or less. This barrier layer provides a second barrier to infiltration. The primary barrier to downward infiltration caused by precipitation is provided by the synthetic membrane. This synthetic membrane is 60 mil high-density polyethylene (HDPE). A drainage/filter layer is then placed on top of the synthetic membrane. This layer is comprised of a synthetic drainage net and a layer of filter fabric. The drainage net intercepts and channels infiltration to drainage trenches around the cap and the filter fabric aids in preventing fine particles from entering and clogging the drainage layer. The final layer of the cap consists of a minimum two-foot thickness of soil. The top six-inch layer is capable of supporting vegetation and protects the underlying cover components from movement due to winds and from ultraviolet degradation. The capping soils will be obtained from off-site borrow areas. The topsoil is fertilized and seeded.

The surface of the cap is graded with a 2 percent slope to provide appropriate runoff and reduce ponding of water on the cap. Drainage ditches around the site will carry this runoff to catch basins. Since the storm water does not come in contact with any waste, it is discharged directly to the river.

The cap is visually inspected periodically. Maintenance includes fertilizing and mowing of the grass and other activities as required.

Other measures provided in this alternative to limit direct exposure to the wastes include securing the site with a fence and placing use restrictions on future development of the site.

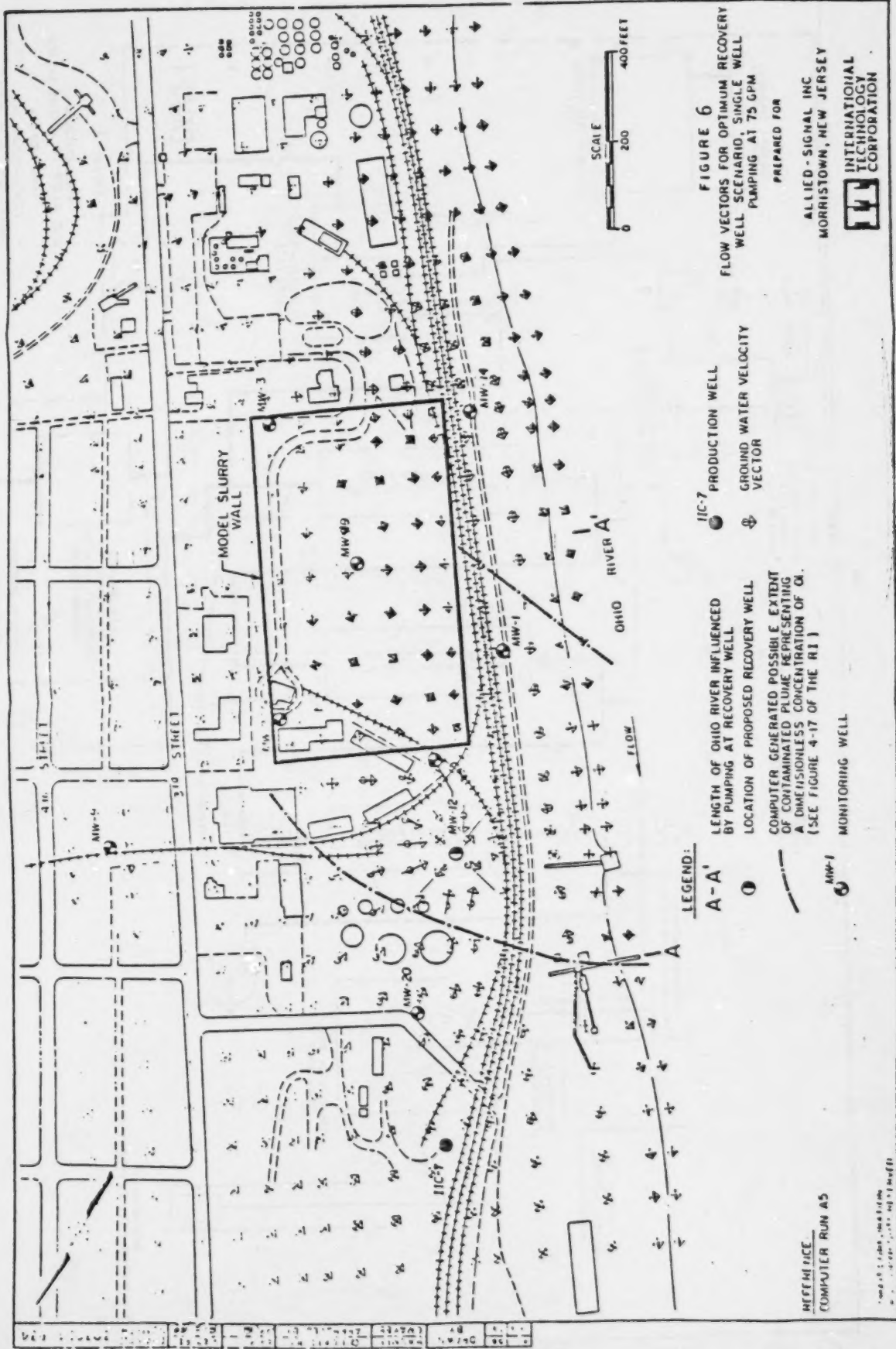
In addition to the ground water collected from inside the slurry wall, ground water is collected from outside of the slurry wall through a six-inch recovery well. The proposed location of this well is shown in Figure 6. The well is operated at 75 gpm. The collected ground water is pumped and transferred through a below-grade piping system to a new on-site treatment unit.¹ The ground water treatment conceptual design is depicted in Figure 7.

The location and pumping rate of this recovery well were based on information collected during the remedial investigation (RI) and the January and February 1988 field investigations conducted by IT. Modeling efforts based on these data resulted in the selection of one well pumping at 75 gpm.

The selected treatment process is activated carbon. This system is used for removal of organic compounds (i.e., mainly naphthalene, benzene, toluene, and xylenes) and cyanides from the ground water before being discharged to the river. Design studies are necessary to determine carbon unit size and change over rates.

Initially, ground water is pumped to an equalization tank. This tank maintains a relatively constant flow and concentration of the components in the ground water before any treatment. The ground water is then pumped to a dual media filtration unit for removal of suspended solids. This is required before introduction to the activated carbon unit to reduce the frequency of the backwashing of the activated carbon column to prevent an excessive pressure drop through the column. The effluent from the dual media filter

¹A new treatment system is proposed for treatment of the GDA ground waters. However, during the detailed design phase, a combined treatment system for both the tar plant process waters and the GDA ground waters will also be evaluated.



is passed through the activated carbon unit for removal of organics and cyanides. The effluent from this treatment unit will be combined with the Tar Plant effluent and discharged to the Ohio River under existing or modified NPDES requirements.²

The influent and effluent are monitored in accordance with agreed upon requirements and reported to the agencies.

During the design of this remedial alternative, the extent and chemical nature of the NAPS layer is defined and remedial options are examined. If feasible and approved by the Agency, the NAPS layer may be mitigated by the implementation of an additional treatment remedy, or expansion of the slurry wall.

This alternative also provides a municipal water supply and bottled water for potable and sanitary use by IIC until acceptable concentrations have been reached in the ground water.

Additionally, site ground water is monitored to confirm that contaminant concentrations do not exceed acceptable limits. Upgradient and downgradient wells are used for the monitoring program. Each well is sampled quarterly and analyzed for an established set of site indicator parameters (i.e., benzene, trichloroethylene (TCE), cyanide, naphthalene, ammonia, chloride, and benzo(a)pyrene). In addition, the ground water portion of this alternative includes properly plugging the suspect and/or unusable monitoring wells.

TCE was detected in Monitoring Well MW-19 for the first time in the January/February 1988 sampling. It was not detected in any prior sampling in any of the GDA wells. In addition, no record of disposing chlorinated hydrocarbons in the GDA exist. Assuming the worst conditions, TCE is included in the ground water monitoring program. If during the initial monitoring of ground water cleanup program the presence of TCE is not confirmed, it would be deleted from the list of site indicator parameters. Prior to its deletion from the monitoring program, approval from the agencies would be obtained.

A supplemental RI/FS will be conducted to determine the extent and nature of the NAPS layer and to examine remedial options including treatment. The time required to complete this alternative is approximately two years. The treatment plant start up is scheduled to begin upon completion of the slurry wall and cap

²If a separate discharge point and NPDES permit are required for the new treatment unit, breakpoint chlorination will be added to the activated carbon system for removal of ammonia.

installation. The ground water clean up standards should be achieved at the III wells in five years, it will take approximately 25 years to reach the ground water cleanup levels near the site. The total present worth cost of this alternative is estimated at \$13,130,000. See Appendix A of this ROD for a complete breakdown of the capital and operation and maintenance costs.

C. ALTERNATIVE 3 - INCINERATION OF GDA WASTE, SLURRY WALL, GROUND WATER TREATMENT, AND MUNICIPAL WATER SUPPLY

Alternative 3 combines treatment of the GDA wastes and contaminated ground water with containment. The major components of this action are:

- Excavation of 40 feet of waste and 12 inches of subsoils
- On-site incineration
- Construction of a retaining structure and a slurry wall encircling the site
- On-site disposal of ash
- Treatment of ground water from inside and outside of the slurry wall at a new treatment facility
- Providing municipal and potable water supply for III
- Monitoring of site ground water
- Deed Restrictions and site security
- NAPS Investigation

In this alternative, the GDA site wastes are excavated and incinerated. Based on historical site drawings and information gathered during the January and February 1988 field investigations conducted by IT at the site, the average depth of wastes in the GDA is estimated at 36 feet and the areal extent is approximately 220,000 square feet. Therefore, the excavation extends approximately 40 feet to the bottom of wastes and the volume of material removed equals 300,000 cubic yards.

Field investigations also confirmed a secondary source of contamination caused by a nonaqueous phase substance present in a 10 to 15 foot-thick layer above the bedrock beneath the site. A retaining structure and slurry wall encircles the site area to control and contain the majority of this secondary source.

The northern and northwestern edges of the site, which are adjacent to railroad tracks, require support during excavation. Because a retaining structure and a slurry wall are in the same general location, a concrete diaphragm wall installed by the slurry trench method is selected. This wall provides structural support as well as the low permeability required to limit contaminant migration. This wall prevents migration of contaminants from the GDA wastes during pumping of site ground water while excavation and backfilling operations are continuing for approximately seven years. Using this technique, a two-foot wide trench is excavated. The trench is excavated in alternate panels, generally, 25-feet long. By simultaneously filling the excavated trench with a bentonite clay solution as excavation occurs, collapse of the soil in each panel is prevented.

When each panel is totally excavated, permanent wall reinforcing steel is then lowered into the trench to the required depth. The panel is then concreted using the tremie concrete technique which displaces the slurry to complete the wall. The slurry is then pumped back to a central mixing plant and prepared for reuse in another panel. Additionally, during excavation stages, the wall is supported laterally by soil tiebacks. The tiebacks consist of a bundle of steel tendons drilled through inclined sleeves cast in the wall.

Structural walls are not necessary for excavation activities proceedings for the eastern and southern portions of the site. Excavation cuts are at a slope of 2 horizontal to 1 vertical. A soil-bentonite slurry wall is placed around these sides of the site after excavation and backfilling is complete.

The excavation and incineration operations are coordinated; therefore, the completion of the excavation is controlled by the rate of incineration of the waste material. Based on the preliminary information gathered during the January/February 1988 investigation, the incinerator feed rate is expected to be ten tons per hour. Considering the operational difficulties and material handling considerations, the incinerator is expected to run approximately 7,000 hours per year.

A front-end loader is used to transfer the solid wastes from the staging area into the feed hopper. The wastes are freed from free water in the staging area. A metal shredder is included to handle scrap metal debris and a small number (one to two) drums. If a large number of drums are encountered, the upgraded model of shredder would be provided. This added requirement of handling drums could cause reduction in the rotary kiln's waste processing rate. The feed is then introduced by gravity into a rotary kiln combustion system which operates below atmospheric pressure in a closely controlled air supply mode. A control system is used to

control the temperature and desorption/combustion characteristics inside the kiln.

The kiln ashes are cooled in a moisture-controlled environment and conveyed to storage where they are sampled and tested for verification of their hazardous nature.

The kiln gases are incinerated in a vertical secondary combustion chamber specifically designed to handle large variations in gas composition and volumes. Gases from the secondary combustion chamber are water scrubbed and then processed through a high-efficiency air pollution control module capable of removing submicron particulate matter and acid gases. The treated gases are exhausted through a stack. Solids are separated from the scrubber water and can be added to the kiln ashes.

An interim ash storage facility which meets the substantive RCRA requirements is constructed on site for temporary storage of incinerator ash until the ash can be placed back into the excavated GDA. The facility covers an approximate 12-acres and has a capacity of 255,000 cubic yards. The facility is constructed by excavating five feet below grade and using this excavated material to construct dikes around the excavation. The dikes are approximately 13 feet in height with slopes of 3 horizontal to 1 vertical. The site is lined with a 60-mil synthetic liner. A six-inch-thick subgrade is prepared before liner installation. To reduce the risk of fugitive dust emissions the ash is covered daily with a vapor suppressant foam. This foam is typically effective for two months. Any areas exposed for two months or greater are covered with a synthetic cover and a six-inch layer of soil.

Upon completion of the excavation and incineration operations, the ash is used to backfill the open excavation to grade. Initially, a soil layer will be placed in the GDA excavation to maintain a five-foot separation between the water table and the ash. Because the water table is approximately five feet above the bottom of the excavation, the soil layer is approximately 10 feet thick. Then, the ashes are placed and compacted. A 15 percent reduction in volume is expected after the material is incinerated; therefore, additional off-site suitable material is used to backfill the excavation.

After backfilling is completed, the slurry wall is installed around the remaining sides (east and south) of the GDA. The slurry wall is constructed of soil-bentonite and extends to bedrock. A detailed description of the soil-bentonite slurry wall is provided under Alternative 2.

Additionally, ground water is collected and treated from both inside and outside of the slurry wall. Details of ground water collection and treatment are provided under Alternative 2.

A minimum two-foot-thick soil layer covers the site. This cover is graded and vegetated to provide sufficient control of surface water and erosion.

If the ash is determined to be hazardous, the cap would comply with the substantive requirements of RCRA.

This alternative also provides a municipal water supply and bottled water for potable and sanitary use by IIC until ground water quality meets acceptable standards. The site ground water is monitored to provide information on the effectiveness of the remedial action and to confirm that the contaminant concentrations do not exceed acceptable limits. The monitoring program is discussed in Alternative 2. Existing monitoring wells in the GDA considered suspect or nonusable would be plugged and abandoned in accordance with the OEPA-approved procedures.

A supplemental RI/FS will be conducted to determine the extent and nature of the NAPS layer and to examine remedial options including treatment. The initial year of the project includes activities necessary for design, bid preparation and contract award as well as the construction and set up for the incineration unit, the ash storage area, the retaining wall, and the treatment plant and recovery wells. The excavation and incineration operations requires five years to complete and the backfilling of the GDA with ash requires another two years. Construction of the slurry wall requires an additional six months. Therefore, the overall schedule for completion of Alternative 3 is eight to nine years. The total present worth cost of Alternative 3 is \$92,230,000. See Appendix A for a cost breakdown of capital and operation and maintenance costs.

D. ALTERNATIVE 4 - INCINERATION OF GDA WASTE AND SUBSOILS, GROUND WATER TREATMENT, MUNICIPAL WATER SUPPLY, AND OFF-SITE DISPOSAL OF ASH

Alternative 4 provides treatment of the GDA source and associated ground water. The major components of this alternative include the following:

- Excavation of 80 feet of wastes and associated contaminated soils
- On-site incineration
- Off-site disposal of ash
- Treatment of ground water
- Providing municipal and potable water supply for users of the IIC wells
- Monitoring of site ground water
- NAPS Investigation

This alternative addresses the excavation and incineration of the primary source of contamination at the GDA, as well as associated contaminated soils and the majority of the NAPS layer. Therefore, the excavation

extends 80 feet to bedrock and requires the removal of approximately 720,000 cubic yards of material.

Due to the extended depth of the excavation, relatively restricted working area, and necessary protection of workers, a double wall soldier piling and lagging technique is preliminarily selected to maintain the open excavation. A double structural wall is constructed by driving two rows of steel soldier piles around the entire perimeter of the site. The soil between the piles is excavated with a clamshell. As this material is excavated, lagging and struts are installed between the walls to provide bracing and stability. After excavating to bedrock, the area between the soldier pile rows is backfilled with clean, granular fill and the fill is compacted. The detailed design of the retaining wall (or type of wall) is addressed during the project design phase.

Once the wall is constructed, the area surrounded by the double wall is excavated. This approximate 220,000 square foot area is excavated down to bedrock (approximate elevation 475 feet mean sea level). As the excavation proceeds, an access ramp is constructed into the pit on the western edge of the site. This access road is 20 feet wide with an approximate 10 percent grade. The side embankment slopes at 2 horizontal to 1 vertical. Dewatering is also necessary during excavation, since the bottom 40 feet of material is below the water table. Therefore, the water table is kept below excavation levels by pumping. The water collected during this procedure is treated through a temporary on-site treatment unit.

Backfilling then begins on the eastern side of the site. Clean suitable material is placed and compacted to construct another access ramp. When the construction of this ramp is completed, the ramp on the western edge of the site is excavated. The remaining area is then backfilled with clean suitable material to existing grades.

The excavated material is incinerated. Therefore, the time to complete excavation is controlled by the rate of incineration. The incinerator throughput rate is a function of the type of material being incinerated (heating value). The expected throughput rate of the slightly contaminated material (i.e., material with heating values less than 800 British thermal unit per pound (Btu/lb) is approximately 15 tons per hour while the contaminated waste, with an average heating value of 5,500 Btu/lb, is treated at nine tons per hour. On average, a feed rate of 12 tons per hour is anticipated. Allowances are made for 20 percent downtime (7,000 hours per year operating) of the system. Based on this information, it is expected that incineration of the GDA waste and subsoils takes between 12 and 13 years. A description of the incineration process is presented under Alternative 3.

Volume reduction of the wastes after incineration is estimated to be 15 percent. Therefore, approximately 612,000 cubic yards of ash material are disposed of in an off-site landfill.

Additionally, site ground water in the vicinity of the removed source is collected and treated. One six-inch-diameter recovery well is used to collect the ground water. The pumping rate of this well is approximately 75 gpm. The collected water is pumped to an on-site treatment unit. This treatment unit will primarily consist of activated carbon. Details of the process are discussed in Alternative 2. Existing monitoring wells in the GDA considered suspect or nonusable would be plugged and abandoned in accordance with the OEPA-approved procedures.

While ground water remediation is continuing, users of the IIC wells are provided with a municipal water supply and bottled water for potable and sanitary use.

A supplemental RI/FS will be conducted to determine the extent and nature of the NAPS layer and to examine remedial options including treatment. It is estimated that the overall time for implementation of this alternative is 13 to 14 years. Excavation and incineration are the controlling activities, which by themselves require 12 to 13 years to complete. The total present worth cost of Alternative 4 is \$218,000,000. See Appendix A for a breakdown of the capital and operation and maintenance costs.

E. Identified ARARs and TBCs

The Federal and State applicable or relevant requirements (ARARs) and other guidelines to be considered (TBCs) are summarized in Table 6 and compared to each of the four (4) alternatives. The ground water clean up standards are outlined in Table 7.

VIII. Summary of Comparative Analysis of Alternatives

A. Summary of the Nine Criteria

U.S. EPA uses nine (9) criteria to evaluate remedial alternatives. These criteria are as follows:

1) Short-Term Effectiveness

The assessment against this criterion examines the effectiveness of alternatives in protecting human health and the environment during the construction and implementation period until the response objectives have been met. The time needed to achieve the cleanup is also evaluated.

2) Long-Term Effectiveness and Permanence

The assessment of alternatives against this criterion evaluate the long-term effectiveness of alternatives in protecting human health and the environment after response objectives have been met. The primary focus of this evaluation is the extent and effectiveness of the controls that may be required to manage the risk posed by treatment residuals and/or untreated wastes.

TABLE 6
SUMMARY OF AREAS AND TSCs
GOLDEN CAMP FEASIBILITY STUDY
ALLIED-SIGNAL/IBOWTON COKE PLANT

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ANARs) AND OTHER ADVISORIES ON GUIDELINES TO BE CONSIDERED (TSCs)* AMBIENT OF CHEMICAL SPECIFIC	ALTERNATIVE 1 NO ACTION			ALTERNATIVE 2 SLURRY WALL AND CAP, GROUND WATER TREATMENT MUNICIPAL WATER SUPPLY			ALTERNATIVE 3 INCINERATION OF COA WASTE, SLURRY WALL, GROUND WATER TREATMENT AND MUNICIPAL WATER SUPPLY			ALTERNATIVE 4 INCINERATION OF COA WASTE AND SUBSOILS, GROUND WATER TREATMENT, MUNICIPAL WATER SUPPLY, AND OFF-SITE DISPOSAL OF ASH		
Maximum Contaminant Level (MCL)	The federal MCL of 0.005 parts per million (ppm) for benzene and trichloroethylene is not achieved.	The federal MCL of 0.005 ppm for benzene and trichloroethylene is achieved in treated ground water and at the presently identified and affected receptor (IIC-7). NAPS layer may affect technical feasibility of meeting this standard. Ground water will be pumped and treated until this standard is achieved at the compliance boundary or until technical infeasibility is demonstrated.	The federal MCL of 0.005 ppm for benzene and trichloroethylene is achieved in treated ground water and at the presently identified and affected receptor (IIC-7). NAPS layer may affect technical feasibility of meeting this standard. Ground water will be pumped and treated until this standard is achieved at the compliance boundary or until technical infeasibility is demonstrated.	The federal MCL of 0.005 ppm for benzene and trichloroethylene is achieved in treated ground water and at the presently identified and affected receptor (IIC-7). NAPS layer may affect technical feasibility of meeting this standard. Ground water will be pumped and treated until this standard is achieved at the compliance boundary or until technical infeasibility is demonstrated.	The federal MCL of 0.005 ppm for benzene and trichloroethylene is achieved in treated ground water and at the presently identified and affected receptor (IIC-7). NAPS layer may affect technical feasibility of meeting this standard. Ground water will be pumped and treated until this standard is achieved at the compliance boundary or until technical infeasibility is demonstrated.	The federal MCL of 0.005 ppm for benzene and trichloroethylene is achieved in treated ground water and at the presently identified and affected receptor (IIC-7). NAPS layer may affect technical feasibility of meeting this standard. Ground water will be pumped and treated until this standard is achieved at the compliance boundary or until technical infeasibility is demonstrated.	Chloride is not applicable. ("No Action" achieves standards)	Chloride is not applicable. ("No Action" achieves standards)	Chloride is not applicable. ("No Action" achieves standards)	Chloride is not applicable. ("No Action" achieves standards)	Chloride is not applicable. ("No Action" achieves standards)	Chloride is not applicable. ("No Action" achieves standards)
Secondary Drinking Water Standard (SDWS)	The upper limit of the sulfate range exceeds the U.S. EPA guideline of 250 ppm but the representative concentration does not.	Chloride concentrations do not exceed the U.S. EPA guideline of 250 ppm.	Treatment for sulfates not provided, representative concentration does not exceed SDWS.	Treatment for sulfates not provided, representative concentration does not exceed SDWS.	Treatment for sulfates not provided, representative concentration does not exceed SDWS.	Treatment for sulfates not provided, representative concentration does not exceed SDWS.	Treatment for sulfates not provided, representative concentration does not exceed SDWS.	Treatment for sulfates not provided, representative concentration does not exceed SDWS.	Treatment for sulfates not provided, representative concentration does not exceed SDWS.	Treatment for sulfates not provided, representative concentration does not exceed SDWS.	Treatment for sulfates not provided, representative concentration does not exceed SDWS.	Treatment for sulfates not provided, representative concentration does not exceed SDWS.
Permissible Ambient Coal, Water Quality Criteria for Protection of Human Health	Amonia concentrations exceed the U.S. EPA ambient goal of 0.30 ppm.	Federal guideline of 0.5 ppm is achieved at the affected receptor (IIC-7). NAPS layer may affect technical feasibility of meeting this standard. Ground water will be pumped and treated until this standard is achieved at the compliance boundary or until technical infeasibility is demonstrated. Treated ground water will meet NPDES substantive requirements.	Federal guideline of 0.5 ppm is achieved at the affected receptor (IIC-7). NAPS layer may affect technical feasibility of meeting this standard. Ground water will be pumped and treated until this standard is achieved at the compliance boundary or until technical infeasibility is demonstrated. Treated ground water will meet NPDES substantive requirements.	Federal guideline of 0.5 ppm is achieved at the affected receptor (IIC-7). NAPS layer may affect technical feasibility of meeting this standard. Ground water will be pumped and treated until this standard is achieved at the compliance boundary or until technical infeasibility is demonstrated. Treated ground water will meet NPDES substantive requirements.	Federal guideline of 0.5 ppm is achieved at the affected receptor (IIC-7). NAPS layer may affect technical feasibility of meeting this standard. Ground water will be pumped and treated until this standard is achieved at the compliance boundary or until technical infeasibility is demonstrated. Treated ground water will meet NPDES substantive requirements.	Federal guideline of 0.5 ppm is achieved at the affected receptor (IIC-7). NAPS layer may affect technical feasibility of meeting this standard. Ground water will be pumped and treated until this standard is achieved at the compliance boundary or until technical infeasibility is demonstrated. Treated ground water will meet NPDES substantive requirements.	Federal guideline of 0.5 ppm is achieved at the affected receptor (IIC-7). NAPS layer may affect technical feasibility of meeting this standard. Ground water will be pumped and treated until this standard is achieved at the compliance boundary or until technical infeasibility is demonstrated. Treated ground water will meet NPDES substantive requirements.	Federal guideline of 0.5 ppm is achieved at the affected receptor (IIC-7). NAPS layer may affect technical feasibility of meeting this standard. Ground water will be pumped and treated until this standard is achieved at the compliance boundary or until technical infeasibility is demonstrated. Treated ground water will meet NPDES substantive requirements.	Federal guideline of 0.5 ppm is achieved at the affected receptor (IIC-7). NAPS layer may affect technical feasibility of meeting this standard. Ground water will be pumped and treated until this standard is achieved at the compliance boundary or until technical infeasibility is demonstrated. Treated ground water will meet NPDES substantive requirements.	Federal guideline of 0.5 ppm is achieved at the affected receptor (IIC-7). NAPS layer may affect technical feasibility of meeting this standard. Ground water will be pumped and treated until this standard is achieved at the compliance boundary or until technical infeasibility is demonstrated. Treated ground water will meet NPDES substantive requirements.	Federal guideline of 0.5 ppm is achieved at the affected receptor (IIC-7). NAPS layer may affect technical feasibility of meeting this standard. Ground water will be pumped and treated until this standard is achieved at the compliance boundary or until technical infeasibility is demonstrated. Treated ground water will meet NPDES substantive requirements.	Federal guideline of 0.5 ppm is achieved at the affected receptor (IIC-7). NAPS layer may affect technical feasibility of meeting this standard. Ground water will be pumped and treated until this standard is achieved at the compliance boundary or until technical infeasibility is demonstrated. Treated ground water will meet NPDES substantive requirements.

See footnote at end of table.

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APPLICABLE OR RELEVANT AND
APPROPRIATE REQUIREMENTS (ARARs)
AND OTHER ADVISORIES ON
GUIDELINES TO BE CONSIDERED (TBCs)

AMBIENT OR CHEMICAL SPECIFIC
(CONT.)

ALTERNATIVE 1
NO ACTION

Cyanide concentrations
exceed the U.S. EPA
ambient goal of 0.2 ppm.

Upper limit of the phenol range
exceeds the U.S. EPA criteria
of 3.5 ppm.

Naphthalene concentrations
exceed the U.S. EPA criteria
of 0.69 ppm.

Benzo-a-pyrene concentrations
exceed the health-based
concentration of 0.0031 parts
per billion (ppb).

Concentration derived from
health-based level or method
detection limit, whichever
is greater.

TABLE 6
(Continued)

ALTERNATIVE 2

SLURRY WALL AND CAP,
GROUND WATER TREATMENT
AND MUNICIPAL WATER SUPPLY

Federal guideline of 0.2 ppm
for cyanide is achieved in
treated ground water and at
receptors. NAPS layer may
affect technical feasibility
of meeting this standard.
Ground water will be pumped and
treated until this standard is
achieved at the compliance
boundary or until technical
infeasibility is demonstrated.

Federal guideline of 3.5 ppm
for phenol is achieved in
treated ground water and at
receptors. NAPS layer may
affect technical feasibility
of meeting this standard.
Ground water will be pumped and
treated until this standard is
achieved at the compliance
boundary or until technical
infeasibility is demonstrated.

Federal guideline of 0.69 ppm
for naphthalene is achieved in
treated ground water and at
receptors. NAPS layer may
affect technical feasibility
of meeting this standard.
Ground water will be pumped and
treated until this standard is
achieved at the compliance
boundary or until technical
infeasibility is demonstrated.

Method detection limit of 0.003
ppb for benzo-a-pyrene is achieved
in treated ground water and at
receptors. NAPS layer may
affect technical feasibility
of meeting this standard.
Ground water will be pumped and
treated until this standard is
achieved at the compliance
boundary or until technical
infeasibility is demonstrated.

ALTERNATIVE 3

INCINERATION OF CDA WASTE,
SLURRY WALL, GROUND WATER TREATMENT
AND MUNICIPAL WATER SUPPLY

Federal guideline of 0.2 ppm
for cyanide is achieved in
treated ground water and at
receptors. NAPS layer may
affect technical feasibility
of meeting this standard.
Ground water will be pumped and
treated until this standard is
achieved at the compliance
boundary or until technical
infeasibility is demonstrated.

Federal guideline of 3.5 ppm
for phenol is achieved in
treated ground water and at
receptors. NAPS layer may
affect technical feasibility
of meeting this standard.
Ground water will be pumped and
treated until this standard is
achieved at the compliance
boundary or until technical
infeasibility is demonstrated.

Federal guideline of 0.69 ppm
for naphthalene is achieved in
treated ground water and at
receptors. NAPS layer may
affect technical feasibility
of meeting this standard.
Ground water will be pumped and
treated until this standard is
achieved at the compliance
boundary or until technical
infeasibility is demonstrated.

Method detection limit of 0.003 ppb
for benzo-a-pyrene is achieved in
treated ground water and at
receptors. NAPS layer may
affect technical feasibility
of meeting this standard.
Ground water will be pumped and
treated until this standard is
achieved at the compliance
boundary or until technical
infeasibility is demonstrated.

ALTERNATIVE 4

INCINERATION OF CDA WASTE AND
SUBSOILS, GROUND WATER
TREATMENT, MUNICIPAL WATER SUPPLY,
AND OFF-SITE DISPOSAL OF ASH

Federal guideline of 0.2 ppm
for cyanide is achieved in
treated ground water and at
receptors. NAPS layer may
affect technical feasibility
of meeting this standard.
Ground water will be pumped and
treated until this standard is
achieved at the compliance
boundary or until technical
infeasibility is demonstrated.

Federal guideline of 3.5 ppm
for phenol is achieved in
treated ground water and at
receptors. NAPS layer may
affect technical feasibility
of meeting this standard.
Ground water will be pumped and
treated until this standard is
achieved at the compliance
boundary or until technical
infeasibility is demonstrated.

Federal guideline of 0.69 ppm
for naphthalene is achieved in
treated ground water and at
receptors. NAPS layer may
affect technical feasibility
of meeting this standard.
Ground water will be pumped and
treated until this standard is
achieved at the compliance
boundary or until technical
infeasibility is demonstrated.

Method detection limit of 0.003
ppb for benzo-a-pyrene is achieved
in treated ground water and at
receptors. NAPS layer may
affect technical feasibility
of meeting this standard.
Ground water will be pumped and
treated until this standard is
achieved at the compliance
boundary or until technical
infeasibility is demonstrated.

TABLE 6
(Continued)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) AND OTHER ADVISORIES OR GUIDELINES TO BE CONSIDERED (TRCs)	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 SLURRY WALL AND CAP, GROUND WATER TREATMENT MUNICIPAL WATER SUPPLY	ALTERNATIVE 3 INCINERATION OF GDA WASTE, SLURRY WALL, GROUND WATER TREATMENT AND MUNICIPAL WATER SUPPLY	ALTERNATIVE 4 INCINERATION OF GDA WASTE AND SUBSOILS, GROUND WATER TREATMENT, MUNICIPAL WATER SUPPLY, AND OFF-SITE DISPOSAL OF ASH
OAC 3745-1-32 Ohio River Criteria	No statistically significant contamination from the site is detected in the Ohio River.	No statistically significant contamination from the site is detected in the Ohio River.	No statistically significant contamination from the site is detected in the Ohio River. Compliance with SIP, NESHAP, and MSPS.	No statistically significant contamination from the site is detected in the Ohio River. Compliance with applicable SIP, NESHAP, and NSPS requirements.
State Implementation Plan - National Emission System for Hazardous Air Pollutants - New Source Performance Standards				
ACTION SPECIFIC (PERFORMANCE; DESIGN)				
40 CFR 264.310 Landfill closure requirements and Postclosure Care	Will not comply with 40 CFR 264.310.	Compliance with 40 CFR 264.310.	Compliance with 40 CFR 264.310 if ash returned to pit is hazardous.	
40 CFR 264.116 and 264.117 Use Restrictions	Will not comply with 40 CFR 264.116 and 264.117.	Compliance with 40 CFR 264.310.	Compliance with 40 CFR 264.310.	Compliance with 40 CFR 264.116.
40 CFR 264.92-264.99 Ground Water Monitoring	Will not comply with 40 CFR 264.92-264.99.	Compliance with 40 CFR 264.92-264.99.	Compliance with 40 CFR 264.92-264.99.	Compliance with 40 CFR 264.92-264.99.
Ohio Administrative Code (OAC) Water Pollution Control 3745-1-05(A)(8) Antidegradation Policy	Will not comply with OAC Antidegradation Policy.	Compliance with OAC Antidegradation Policy.	Compliance with OAC Antidegradation Policy.	Compliance with OAC Antidegradation Policy.
OAC 3745-31-05(A)(3) Permit to Install	-	Compliance with OAC 3745-31-05(A)(3).	Compliance with OAC 3745-31-05(A)(3).	Compliance with OAC 3745-31-05(A)(3).
OAC 3745-33-04 NPDES Permit	-	Compliance with OAC NPDES Permitting.	Compliance with OAC NPDES Permitting.	Compliance with OAC NPDES Permitting.
OAC 3745-15-07 Air Pollution	-	Compliance with fugitive dust regulations.	Compliance with OAC 3745.	Compliance with OAC 3745.
OAC 3745-81 through 3745-99 Public Water Supply	-	Compliance with OAC 3745-81 through 3745-99.	Compliance with OAC 3745-81 through 3745-99.	Compliance with OAC 3745-81 through 3745-99.
OAC 3745-53-11 Hazardous Waste Transport	-	Compliance with OAC 3745-53-11.	Compliance with OAC 3745-53-11.	Compliance with OAC 3745-53-11.

See footnote at end of table.

TABLE 6
(Continued)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) AND OTHER ADVISORIES ON GUIDELINES TO BE CONSIDERED (TRCs)	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 SLURRY WALL AND CAP, GROUND WATER TREATMENT MUNICIPAL WATER SUPPLY	ALTERNATIVE 3 INCINERATION OF GDA WASTE, SLURRY WALL, GROUND WATER TREATMENT AND MUNICIPAL WATER SUPPLY	ALTERNATIVE 4 INCINERATION OF GDA WASTE AND SUBSOILS, GROUND WATER TREATMENT, MUNICIPAL WATER SUPPLY, AND OFF-SITE DISPOSAL OF ASH
OAC 3745-21-05 Air Nondegradation Policy	-	Full compliance	Compliance with Air Nondegradation Policy.	Compliance with Air Nondegradation Policy.
OAC 37-21-07(3)(C) Control of Air Emissions	-	-	Compliance with OAC 3745-07.	Compliance with OAC 3745-07.
40 CFR 264.340-264.351 Waste Analysis, Monitoring, Inspections, and Closure	-	-	Compliance with 40 CFR 264.340-264.351.	Compliance with 40 CFR 264.340-264.351.
40 CFR 270.19 and 270.62 Tidal Burns	-	-	Compliance with 40 CFR 270.19 and 270.62.	Compliance with 40 CFR 270.19 and 270.62.
CERCLA Off-Site Disposal Policy and CERCLA 121(d)(1)	-	Compliance for spent carbon.	Compliance if ash is hazardous and for spent carbon.	Compliance if ash is hazardous and for spent carbon.
40 CFR 260.10 40 CFR 264 Storage During Incineration Activities	-	-	Compliance with 40 CFR 260.10 and 40 CFR 264.	Compliance with 40 CFR 260.10 and 40 CFR 264.
40 CFR 262 40 CFR 263 Generator and Transporter Criteria	-	Compliance with 40 CFR 262 & 263 for transport of regulated quantities of spent carbon if it is a hazardous waste.	Compliance with 40 CFR 262 and 40 CFR 263.	Compliance with 40 CFR 262 and 40 CFR 263.
OAC 3745-17-05 (Particulate Matter Non-Degradation) OAC 3745-17-07 (Visible Stack Emissions) OAC 3745-17-08 (Fugitive Dust) OAC 3745-17-09 (Particulate Emissions from Incinerator)	-	Compliance with OAC 3745-17-08 and 3745-17-05	Compliance with OAC 3745-17-05, 07, 08, & 09.	Compliance with OAC 3745-17-05, 07, 08, & 09.
Nondegradation Policy Particulate Matter Standards	-	-	-	-
Achieve destruction and removal efficiency of 99.99% for each principal organic hazardous constituent	-	-	Will achieve 99.99% efficiency for destruction and removal of organic hazardous constituents in incineration.	Will achieve 99.99% efficiency for destruction and removal of organic hazardous constituents in incineration.
Incineration Performance Standards 40 CFR 264.340-351	-	-	Will meet.	Will meet.

See footnotes at end of table.

TABLE 6
(Continued)

APPLICABLE OR RELEVANT AND PROPRIATE REQUIREMENTS (ARARs) AND OTHER ADVISORIES OR GUIDELINES TO BE CONSIDERED (TBCs)	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 SLURRY WALL AND CAP, GROUND WATER TREATMENT MUNICIPAL WATER SUPPLY	ALTERNATIVE 3 INCINERATION OF GDA WASTE, SLURRY WALL, GROUND WATER TREATMENT AND MUNICIPAL WATER SUPPLY	ALTERNATIVE 4 INCINERATION OF GDA WASTE AND SUBSOILS, GROUND WATER TREATMENT, MUNICIPAL WATER SUPPLY, AND OFF-SITE DISPOSAL OF ASH
Radioactive Materials Concentration in Spent Carbon DOT Transport Regulations 49 CFR 171-173, 177 & 178 if Combined Radioactive Concentra- tion or Collection Media Exceeds 0.002 $\mu\text{Ci}/\text{gram}$ Ohio Regulations for NARMs - OAC 3701-70, 71, & 78 if Lead-210 exceeds 0.1 $\mu\text{Ci}/\text{gram}$ on Collection Media SO ₂ Emissions	Will comply if applicable concentrations exceeded.	Will comply if applicable concentrations exceeded.	Will comply if applicable concentrations exceeded.	Will comply if applicable concentrations exceeded.
		Will meet applicable SO ₂ emission limits if SO ₂ is expected to be a combustion product.	Will meet applicable SO ₂ emission limits if SO ₂ is expected to be a combustion product.	Will meet applicable SO ₂ emission limits if SO ₂ is expected to be a combustion product.

Substantive requirements of ARARs, not administrative requirements, must be met for on site actions. TBCs are not promulgated regulations and have no administrative requirements. Appendix E for description of pertinence of ARARs and TBCs.

Demonstrations of technical infeasibility of meeting ground water cleanup standards must be approved by the Agencies prior to an ACL being granted

TABLE 7
U.S. ENVIRONMENTAL PROTECTION AGENCY
GROUND WATER STANDARDS

PARAMETER	TREATMENT LEVELS
Ammonia	0.50 mg/l ^a
Chloride	250 mg/l ^b
Total Cyanide	0.2 mg/l ^c
Phenolics	0.3 - 3.5 mg/l ^d
Benzene	0.005 mg/l ^e
Naphthalene	0.69 mg/l ^f
Benzo-a-pyrene	0.005 ug/l ^g

^a"mg/l" equals milligrams per liter or parts per million. The indicated value is a U.S. EPA estimated permissible ambient goal based on human health effects. The estimated permissible ambient goal based on ecological effects is 0.01 mg/l. These goals are not regulatory standards.

^bThe indicated value is a U.S. EPA Secondary Drinking Water Standard (SDWS). This value is based on aesthetic water quality, not health standards, relating to public acceptance of drinking water. SDWS are not federally enforceable but are intended to serve as guidelines to the states.

^cThe indicated value is a U.S. EPA toxic pollutants water quality criteria for the maximum protection of human health.

^dAs indicated, 0.3 mg/l is the aesthetic water quality level for controlling undesirable taste and odor, while 3.5 mg/l is the criteria established for the protection of human health.

^eThe proposed value in Federal Register, Volume 50, No. 219, November 13, 1985, Safe Drinking Water Act (SDWA), Maximum Contaminant Level (MCL) is 0.005 mg/l.

^fThe indicated value is a U.S. EPA estimated permissible ambient goal based on health effects. The estimated permissible ambient goal based on ecological effects is 0.05 mg/l. These goals are not regulatory standards.

^g"ug/l" equals micrograms per liter or parts per billion. This value represents the current instrument detection limit. The actual 10^{-6} cancer risk level is 0.0031 ug/l.

3) Reduction of Toxicity, Mobility or Volume

The assessment against this criterion evaluates the anticipated performance of specific treatment technologies. This evaluation criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies to permanently and significantly reduce toxicity, mobility, or volume of wastes.

4) Implementability

The implementability criterion addresses the technical and administrative feasibility of implementing an alternative and the availability for various services and materials required during implementation.

5) Cost

Cost evaluation of each alternative includes consideration of capital costs and annual operation and maintenance costs. The accuracy provided by these cost estimates ranges from plus 50 percent to minus 30 percent. A present worth analysis is also conducted, allowing all remedial action alternatives to be compared on the basis of a single figure. The cost figures may increase depending on the actions required to mitigate the NAPS layer of contamination.

6) Compliance with ARARs

This evaluation criterion is used to determine how each alternative complies with applicable or relevant and appropriate federal and state requirements (ARARs). Several types of requirements that Superfund actions may have to comply with include ambient- or chemical-specific requirements which set health- or risk-based concentration limits, performance or design requirements that set controls on activities related to management of hazardous substances or contaminants, and siting requirements which set restrictions on activities depending on the characteristics of a site or its immediate environs. In addition, the alternatives are also assessed against other information in the form of advisories, criteria, and guidances that are not ARARs but have been identified by the agencies as criteria-to-be-considered (TBC) because they have been determined to be necessary to ensure protection of human health and the environment and are appropriate for the site.

7) Overall Protection of Human Health and the Environment

The assessment against this criterion describes how the alternative, as a whole, protects and maintains protection of human health and the environment. The overall assessment of protection is based on a combination of factors previously assessed under other criteria, including long-term effectiveness, short-term effectiveness, and compliance with ARARs.

This evaluation focuses on how a specific alternative achieves protection over time and how site risks are reduced. The evaluation also indicates how each source of contamination is to be eliminated, reduced, or controlled for each alternative.

8) State Acceptance

This assessment evaluates the technical and administrative issues and concerns the State (or support agency in the case of state-lead sites) may have regarding each of the alternatives.

9) Community Acceptance

This assessment incorporates public input into the analysis of alternatives and reflects the community's apparent preferences or concerns about alternatives.

B. Summary of Individual Analysis of Alternatives

The following is a summary of the analysis of each alternative against the nine criteria. The Feasibility Study (Chapter 6) contains a Full discussion of how each alternative compared to the criteria.

Alternative 1 - No Action

1) Short-term Effectiveness

- Continued ground water contamination
- Continued migration of contaminated ground water to Ironton Iron Inc.
- Potential for direct contact with waste oozing up through existing cap

2) Long-term Effectiveness and Permanence

- Continued ground water contamination
- Continued migration of contaminated ground water to Ironton Iron Inc. wells and Ohio River
- Not permanent - no treatment of contaminants provided

3) Reduction of Toxicity, Mobility, or Volume

- no reductions provided

4) Implementability

- no construction, therefore, no technical difficulties, no permits necessary, no monitoring provided

- 5) Costs
 - ° no associated costs
- 6) Compliance with ARARs
 - ° MCLs and TBCs in ground water not met, waiver not justifiable
- 7) Overall Protection of Human Health and Environment
 - ° adequate protection not provided
 - ° risks remain due to present and future ground water contamination
- 8) State Acceptance
 - ° State does not support no action
- 9) Community Acceptance
 - ° Community did not comment on this alternative

Alternative 2 - Slurry Wall/Cap, Ground Water Extraction and Treatment, Municipal Water, NAPS Investigation

- 1) Short-term Effectiveness
 - ° no detrimental effects to community, little to no waste disturbance, dust suppression and protective measures taken
 - ° additional groundwater contamination controlled by waste isolation and containment in fifteen (15) months
 - ° ground water cleanup achieved at Iron-ton Iron Inc. in five (5) years
 - ° ground water cleanup achieved at site estimated at twenty-five (25) additional years
 - ° minimal detrimental effects to on-site workers expected, protective measures required
- 2) Long-term Effectiveness and Permanence
 - ° Long-term effectiveness of slurry wall/cap ensured by well constructed and properly maintained and monitored containment system

- ' Containment system is not permanent, however, with proper construction and maintenance, it is reliable
- ' Risk from waste remaining on-site should containment fail are small due to inward ground water gradient and slurry wall integrity monitoring
- ' Long-term management of containment system required
- ' Permanent, reliable ground water treatment provided
- ' Ground water treatment effective in long-term
- 3) Reduction of Toxicity, Mobility, or Volume
 - ' Ground water treatment provides 99% reduction in toxicity of contaminants
 - ' Waste is contained, no reduction in toxicity, mobility, or volume of contaminants in waste in the GDA
- 4) Implementability
 - ' Not technically complex, high level of quality assurance/quality control necessary for design and construction of slurry wall
 - ' Materials and services available
 - ' Discharge of treated water requires compliance with NPDES limitations
 - ' Access to property not owned by Allied required
- 5) Cost
 - ' Total capital and present work O & M = \$13,130,000
- 6) Compliance with ARARS
 - ' Complies with ARARS, however current ground water clean up levels may not be technically feasible, technical feasibility evaluated during remedial action
- 7) Overall Protection of Human Health and Environment
 - ' Existing ground water contamination mitigated through treatment
 - ' Future ground water contamination eliminated by isolation and containment of source

- Ironton Iron supplied municipal water hook-up for in-plant potable and sanitary uses until ground water cleanup levels achieved
 - NAPS investigation to examine remedial alternatives for NAPS layer, especially treatment
- 8) State Acceptance
- State has indicated it accepts this alternative
- 9) Community Acceptance
- Judging from community response at the public meeting, the community accepts this alternative. However, no specific written comments were received from the community on this alternative. The Department of Interior, a public agency, commented on this alternative.

Alternative 3 - Incinerate Waste, Slurry Wall For NAPS layer, Ground Water Treatment, Municipal Water, NAPS Investigation

- 1) Short-term Effectiveness
- Need high level of protective measure (foam, respiratory equipment) to mitigate potential short-term risk to community and on-site workers due to disturbance of waste
 - 5 years to achieve cleanup of waste, 3 additional years to replace ash and construct slurry-wall for NAPS layer
 - 5 years to achieve ground water clean up at Ironton Iron wells
 - 25 years estimated to achieve ground water cleanup levels near site
- 2) Long-term Effectiveness and Permanence
- Incineration of waste and treatment of ground water effective in long-term and permanent.
 - Long-term effectiveness of containment system for redisposed ash and NAPS layer ensured by well constructed and maintained system
 - Containment is not permanent, however, with proper construction and maintenance, it is reliable
 - Long-term management of containment system required

- ' Risk from waste remaining on-site should containment fail is small due to inward ground water gradient
- 3) Reduction of Toxicity, Mobility, or Volume
 - ' Groundwater treatment provides 99% reduction of toxicity of contaminants
 - ' Incineration of GDA waste reduces 80% of toxicity of contaminants and reduces volume by 15%
- 4) Implementability
 - ' Technically complicated to implement incineration portion or remedy
 - ' Materials handling problem from tarry, semi-solid waste
 - ' Construction of stabilizing wall necessary for excavation
 - ' Materials and services (transportable rotary kiln) availability limited
 - ' Access required to off-site properties
 - ' Test burn approved by Agencies required
 - ' NPDES limitations must be met
- 5) Cost
 - ' Total capital and present worth O & M = \$92,230,000
- 6) Compliance with ARARs
 - ' Complies with ARARs, however it may not be technically feasible to achieve current ground water cleanup standards, technical feasibility evaluated during remedial action
- 7) Overall Protection of Human Health and Environment
 - ' Existing ground water contamination mitigated through treatment
 - ' Future ground water contamination eliminated through treatment of primary source (GDA waste) and containment of majority of secondary source (NAPS layer)
 - ' Ironton Iron supplied municipal water hook-up until ground water cleanup levels achieved

- ° NAPS investigation to examine remedial alternatives for NAPS layer, especially treatment

8) State Acceptance

- ° State would accept this alternative

9) Community Acceptance

- ° Community did not comment specifically on this alternative

Alternative 4 - Incinerate Waste, Underlying Soils and NAPS Layer, Ground Water Treatment, Municipal Water, NAPS Investigation

1) Short-term Effectiveness

- ° Need high level of protective measures (foam, respiratory, equipment) to mitigate potential short-term risks to community and on-site workers due to disturbance of wastes
- ° 14 years to complete incineration
- ° 5 years to achieve ground water cleanup levels at Ironton Iron wells
- ° 25 years estimated to achieve ground water cleanup levels near site

2) Long-term Effectiveness and Permanence

- ° Incineration of waste, underlying soils, and majority of NAPS layer effective in long-term and permanent
- ° Ground water treatment effective in long-term and permanent
- ° No need for long-term management

3) Reduction of Toxicity, Mobility, or Volume

- ° Overall toxicity of waste, underlying soils, majority of NAPS layer, and ground water reduced by 99%

4) Implementability

- ° Technically complicated to implement incineration portion or remedy

- ° Materials handling problem due to tarry, semi-solid nature of waste and need to dewater all materials below water table
 - ° Construction of stabilizing wall necessary for excavation
 - ° Availability of transportable rotary kiln limited
 - ° Access to off-site properties required
 - ° Test burn to be approved by Agencies
 - ° NPDES limitations must be met
- 5) Cost
- ° Total capital and present worth O & M = \$218,000,00
- 6) Compliance with ARARs
- ° Complies with ARARs, however it may not be technically feasible to achieve ground water clean up levels, technical feasibility evaluated during remedial action
- 7) Overall Protection of Human Health and Environment
- ° Existing ground water contamination mitigated through treatment
 - ° Future ground water contamination eliminated through treatment of primary and majority of secondary source
 - ° Ironton Iron supplied with municipal water hook-up until cleanup levels achieved
 - ° NAPS investigation to examine remedial alternatives for NAPS layer, especially treatment
- 8) State Acceptance
- ° State believes this alternative is not practical
- 9) Community Acceptance
- Community did not comment on this alternative

C. Summary of Comparison of Alternatives

Table 8 presents the comparative analysis of the four alternatives. The following is a summary of the key advantages and disadvantages of the alternatives.

- 1) Short-term Effectiveness: Alternative 2 offers several advantages over Alternatives 3 and 4 in regard to short-term effectiveness. Alternative 2 poses less potential for risk to on-site workers and the community because the hazardous waste is disturbed as little as possible. Alternatives 3 and 4 require a high level of health and safety procedures to ensure the safety of the workers because the waste will be disturbed. Alternatives 3 and 4 also require the use of foam to reduce volatile air emissions. Alternative 2 can be implemented faster than Alternatives 3 and 4.
- 2) Long-term Effective and Permanence: The long-term effectiveness of Alternative 2 will be ensured by the well designed, maintained, and monitored containment system. It does, however, require long-term management. Alternative 3 will also be effective in the long-term because the primary source is treated and the majority of the secondary source is contained by a well designed, maintained and monitored system. Alternative 3 also requires long-term management. Repair or replacement of the containment systems of Alternatives 2 and 3 may be necessary in the future. Alternative 4 offers advantages over Alternatives 2 and 3 because when ground water cleanup standards are achieved all management can be terminated. All the alternatives, except no action, provide for the permanent treatment of contaminated ground water. Alternative 3 provides a greater degree of permanence than Alternative 2 because the contents of the GDA waste pit are permanently treated. Alternative 4 provides the greatest degree of permanence because the GDA waste pit, contaminants in the aquifer material, and the majority of the NAPS layer is permanently treated.
- 3) Reduction in Toxicity, Mobility, or Volume of Contaminants: All the alternatives except no action, provide for the permanent reduction of the toxicity, mobility, or volume of contaminants in the ground water. According to the Endangerment Assessment, ground water contamination is a principal threat at the GDA. Alternative 3 offers an advantage over Alternative 2 by providing of reduction in the toxicity, mobility, and volume of the contaminants in the GDA waste pit. Alternative 4 offers an advantage over Alternatives 2 and 3 by providing the greatest degree of reduction in the toxicity, mobility, and volume of contaminants.

ASSIGNED FACTORS

Page 8

ALTERNATIVE 1
NO ACTION
No remediation provided.

ENVIRONMENTAL EFFECTS

- Time Until Protection is Achieved.

No additional protection provided.

Concentration will continue to migrate off site. Risk to humans and fish will increase to 10⁻⁶ risk level at 100 years.

- Protection of Community During Remedial Action (CA)

Consumption of fish and drinking water from the river presents a carcinogenic risk level of 10⁻⁶ or less.

- Protection of Workers During CA

Not applicable.

- Environmental Impact

Continued contamination of ground water. Tendency for naphthalene and benzene to bioaccumulate in fish.

LONG-TERM EFFECTS

- Magnitude of Residual Risk

Fish can bioaccumulate benzene and naphthalene lipophilic compounds.

Consumption of fish and drinking water from the river presents a carcinogenic risk level of 10⁻⁶ or less.

Maximum daily intake to caffeine exposure is not exceeded.

SUMMARY OF ALTERNATIVES AVAILABLE

ALTERNATIVE 2 (CONTINGENCY)
SLURRY WALL
CAP AND GROUND WATER MONITORING

Slurry wall to be drilled; place multistage cap (lead treat) ground water from within the slurry wall (create forced gradient). Pump and treat water with activated carbon. Provide municipal water to LIC and provide 300 gpm ground water production well to LIC monitoring.

Cap, slurry wall, and treatment plant construction could take 18 months. Ground water recovery wells would be installed. Ground water treatment plant would be installed. Ground water treatment plant would be installed. Ground water treatment plant would be installed.

Increase in dust. Concentrated ground water to be pumped and treated.

Feeding of exposed materials provides safe environment for nearest residents.

LIC is provided with municipal water during remedial actions.

Impacts of site materials pose no threat to nearest residents.

Protection required against direct contact and ingestion during nine months of active construction. Protection required against exposure from vapors during five months of gas venting system. Mitigated by protective clothing and breathing apparatus.

Will stop short-term incremental fish contamination. Improvement of ground water after slurry wall installation and treatment.

A study of the MWP layer will be conducted during design. After ground water extraction and treatment in compliance with state and federal standards, the MWP layer will be removed. The LIC receptor containment level will be less than 5 ug/l of benzene (which meets the MCL).

Reduces the potential for direct contact. Prevents leaching of contaminants to ground water. Will effectively contain majority of secondary source (leak) from leaching off site. In addition, MWP treatment options are available.

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ALTERNATIVE 3 (TREATMENT)
INCORPORATION OF CAP AND GROUND WATER MONITORING
AND GROUND WATER TREATMENT

Construct combined structural wall and slurry wall around north and northwest side of CA; install 12-inch and 18-inch of subsoil; incorporate 300 gpm of water and 100,000 lbs of activated carbon. Provide 300 gpm of water and 100,000 lbs of activated carbon. Provide 300 gpm of water and 100,000 lbs of activated carbon.

Feasible working months for contract set up, trial bore, construction of structural wall (north and northwest of CA) and incorporation of water and activated carbon. Ground water treatment plant would be installed. Ground water treatment plant would be installed.

Significant increase in dust and potential risk from combustion during excavation (1 year). Feeding of exposed materials provides safe environment for nearest residents.

Pump and treat ground water from CA. LIC is provided with municipal water during remedial actions. Impacts of site materials pose no threat to nearest residents.

LIC is provided with municipal water during the remedial actions. Impacts of site materials pose no threat to nearest residents.

Potential for accidental spillage of ash to CA (1-year duration).

Protection required against direct contact and ingestion during nine months of active construction. Protection required against exposure from vapors during five months of gas venting system. Mitigated by protective clothing and breathing apparatus.

Potential air impacts from incineration. Potential for exposure (direct) to contaminated ground water during slurry wall (last year of construction). Mitigated by protective clothing and breathing apparatus.

Potential for dust from excavation. Potential thermal pollution and minor air quality impacts from incineration (7 years).

Will stop short-term and long-term incremental fish contamination. Improvement of ground water.

Treatment of waste and ground water significantly reduces residual site risk.

A study of the MWP layer will be conducted during design. After ground water extraction and treatment in compliance with state and federal standards, the MWP layer will be removed. The LIC receptor containment level will be less than 5 ug/l of benzene (which meets the MCL).

ash (contaminated only due to ash) will be stored above ground water; prevents leaching of contaminants to ground water. Slurry wall would prevent off-site migration of majority of the secondary source (leak). In addition, MWP treatment options are available.

ALTERNATIVE 4 (TREATMENT)
INCORPORATION OF CAP AND GROUND WATER MONITORING
AND GROUND WATER TREATMENT

Construct combined structural wall and slurry wall around north and northwest side of CA; install 12-inch and 18-inch of subsoil; incorporate 300 gpm of water and 100,000 lbs of activated carbon. Provide 300 gpm of water and 100,000 lbs of activated carbon. Provide 300 gpm of water and 100,000 lbs of activated carbon.

Feasible working months for contract set up, trial bore, and incorporation of water and activated carbon. Ground water treatment plant would be installed. Ground water treatment plant would be installed.

Significant increase in dust and potential risk from combustion during excavation (1 year). Feeding of exposed materials provides safe environment for nearest residents.

Pump and treat contaminated ground water.

LIC is provided with municipal water during remedial actions. Impacts of site materials pose no threat to nearest residents.

Potential for accidental spillage and exposure of population to ash (100,000 lbs) during transport to an off-site disposal facility over 10 years.

See as Alternative 3 except exposures are for longer duration (thirteen years).

Excavation to 80 feet with ground water table at 40 feet will result in a higher potential risk to site workers.

Potential air impacts from incineration (13 years). Potential exposure to ground water mitigated by protective clothing and breathing apparatus.

See as Alternative 3 except longer duration (13 years).

Treatment of waste, subsoils, and ground water will eliminate sources of pollution.

A study of the MWP layer will be conducted during design. After ground water extraction and treatment in compliance with state and federal standards, the MWP layer will be removed. The LIC receptor containment level will be less than 5 ug/l of benzene (which meets the MCL).

Residual ash would be disposed of in a secure landfill. This would reduce degradation of environment.

ASSESSMENT FACTORS

- Adequacy of Controls

Secured sites, no other controls are provided.

- Reliability of Controls

Reliance on fences; direct contact of direct waste by unauthorized people possible; high level of residual risk; further degradation of ground water likely.

REDUCTION OF TOXICITY, MOBILITY, OR VOLUME

- Technical Feasibility

No additional measures are provided. Spread of ground water plume would make remediation more difficult in the future.

- Administrative Feasibility

No construction or any discharge provided, no permit required.

- Availability of Services and Materials

None required.

COST

- Capital Cost
- O&M (Present worth - 10 years)
- Present Worth (Capital plus O&M)

COMPLIANCE WITH ADA/TSC

- Compliance with ADA

ADA in ground water would not be attained.

- Appropriateness of water
- Compliance with critical
- Guidance.

Not Justifiable.
Does not meet TSC criteria.

Not required.
TSC will be met.

ALTERNATIVE 3 (CONTAMINANT)
SLOTTED WALL WITH CAP AND GROUND
WATER TREATMENT

Cap, slurry wall, lower gradient, and off-site ground water will be treated. All treated technologies are reliable. Maintenance of cap, recovery wells and treatment plant, and possibly replacement of recovery and treatment system may be required during the 10 years.

Monitoring wells and recovery wells would monitor the effectiveness of cap and slurry wall.

With proper maintenance of cap, monitoring wells, pump, and recovery plant, likelihood of failure is small, and long-term effectiveness is ensured.

Likelihood of failure of slurry wall is small. Ground water monitoring needed to verify performance.

Containment system does not permanently destroy the waste. No reduction in toxicity, mobility, or volume of CMA waste.

Volume and toxicity of ground water contamination significantly reduced by extraction and treatment.

Contaminants in the bottom layer are relatively immobile in water, are immobile and the majority of this layer will be further contained by the slurry wall. The potential reduction of toxicity, mobility, or volume of this layer will be realized during design.

Construction of slurry wall, cap, ground water capture and treatment system can be implemented effectively applying existing technology.

Substantive permit requirements for modification to existing for plant #925 permit to discharge treated ground water.

Services and materials readily available.

4,500,000
8,250,000
13,100,000

All ADA will be met at the presently identified extraction. Ground water at compliance boundary may not meet ADA because of the ADA layer. The technical feasibility of achieving ADA and TSC in the ground water will be evaluated every five years throughout the remedial action.

Not required.
TSC will be met.

ALTERNATIVE 3 (CONTAMINANT)
INCINERATION WITH SLOTTED WALL,
AND GROUND WATER TREATMENT

Incineration is a proven technology. Effectiveness of slurry wall would be monitored using compliance wells and groundwater.

Compliance monitoring wells would be effective to monitor adverse impacts. If and when treated waste and effectiveness of slurry wall is measured by monitoring wells and recovery wells.

Likelihood of failure of slurry wall is small. Ground water monitoring needed to verify performance.

Incineration of CMA waste pit is a permanent destruction remedy.

Toxicity of CMA waste and ground water significantly reduced.

Organic contaminants are eliminated, and the volume of residual ash will be reduced by 10%. Ash is not likely to further degrade the ground water.

Contaminants in the bottom layer are relatively immobile in water, are immobile and the majority of this layer will be further contained by the slurry wall. The potential reduction of toxicity, mobility, or volume of this layer will be realized during design.

Destruction 40 feet deep and in the proximity of an active waste would require special engineering and construction. Technology exists for implementing this.

Incineration would require special equipment, vessels, and operators; residuals will require treatment and disposal; the technology has been demonstrated; site-specific waste handling would require some adjustment during the incineration.

Construction of slurry wall, ground water capture and treatment system, temporary ash storage facility, and monitoring and using common construction techniques, equipment, and materials.

Agency approval of total burn and approval of the residue of residual ash would be required.

Substantive permit requirements for modification to existing for plant #925 permit to discharge treated ground water.

Transportable incinerator and operators needed. Limited number of mobile incinerators available in the country.

Services and materials for measures other than incinerator are readily available.

10,550,000
8,400,000
91,250,000

See as Alternative 2.

See as Alternative 2.

Not required.
TSC will be met.

Not required.
TSC will be met.

ALTERNATIVE 3 (CONTAMINANT)
INCINERATION OF CMA WASTE AND SLOTTED
GROUND WATER TREATMENT, OFF-SITE DISPOSAL

Incineration is a proven technology. After ground water is treated to acceptable levels, no long-term management is required. Compliance well and treatment plant follow-up/monitoring would be adequate to monitor the performance of ground water extraction and treatment system.

Limited monitoring needed to verify ground water performance.

Incineration of CMA waste pit, contaminated soil, and most of the HAP layer is a permanent destruction remedy.

Toxicity and volume of CMA waste and residuals including bottom layer of organics will be eliminated.

Toxicity and volume of ground water contamination significantly reduced.

The potential reduction of toxicity, mobility, or volume of the remaining HAP layer will be realized during design.

Destruction 80 feet deep (40 feet into ground water) and in the proximity of an active waste would require special construction measures. Residuals higher level of risk, but can be implemented.

Incineration, same as Alternative 3, technology sophisticated, but implementable.

Ground water capture and treatment system can be constructed using common engineering practices.

Agency approval of total burn and approval of testing results for residual ash required.

Substantive permit requirements for modification to existing for plant #925 permit to discharge treated ground water.

See as Alternative 3.

- 4) Implementability: Alternative 2 offers advantages over Alternative 3 and 4 in regard to implementability. Alternative 2 is not technically complicated, although proper construction of the slurry wall requires a high degree of quality assurance/quality control. The materials and services are available and few administrative requirements are necessary. Alternatives 3 and 4 present technical difficulties. The excavation of the waste pit will require the construction of walls to provide stability. The tarry, semi-solid material in the waste pit will present a materials handling problem. The incineration of the waste material will be a complex operation requiring specially trained operators. The availability of both is limited. In addition, a test burn must be conducted and approved by the Agencies before implementation of these remedies can take place.
- 5) Cost: Alternative 2 offers advantages over Alternatives 3 and 4 because it is the least costly alternative at a total present worth cost of \$13,130,000. Alternative 3 is 7 times more costly than Alternative 2 at a estimated total present worth of \$92,230,000. Alternative 4 is nearly 2.5 times more costly than Alternative 3 and more than 16 times more costly than Alternative 2.
- 6) ARARS: All the alternatives, except no action, will meet the Federal and State ARARS summarized in Table 6 and 7. However, the ground water cleanup standards for benzene (5ppb) and PAHs (5ppt) may not be technically feasible to reach. This is especially true if feasible treatment alternatives are not available for the NAPS layer. The ability to achieve the cleanup levels can best be evaluated using data from the operating extraction and treatment system. Therefore, the technical feasibility of reaching these standards will be assessed every five (5) years throughout the remedial action.
- 7) Overall Protectiveness of Human Health and the Environment: All the alternatives, except no action, provide overall protection of human health and the environment. Alternatives 2, 3, and 4 provide permanent treatment of a principal threat at the site, the contaminated ground water. Alternative 2 will eliminate future ground water contamination by isolating and containing the GDA waste and the majority of the NAPS layer. Alternative 3 will eliminate future ground water contamination by treating the GDA waste and containing the majority of the NAPS layer. Alternative 4 will eliminate future ground water contamination by treating the GDA waste, the contaminants in the aquifer material and the majority of the NAPS layer.

- 8) State Acceptance: The State will not accept the no action alternative. The State has indicated that although it prefers treatment of waste to containment, considering all factors, it will accept Alternative 2. The State would also accept Alternative 3. The State believes Alternative 4 is not practical.
- 9) Community Acceptance: The community did not raise opposition to U.S. EPA's preferred alternative, Alternative 2, at the public meeting held on August 16, 1988. The community did not negatively or favorably comment in writing on any of the alternatives. Local officials accept U.S. EPA's preferred alternative, Alternative 2, and would like to see local contractors used for the action as much as possible.

IX. Selected Remedy

Based on the evaluation of the alternatives, U.S. EPA selects Alternative 2 - Slurry Wall and Cap, Ground Water Extraction and Treatment, Municipal Water Hook-up for Ironton Iron Inc., NAPS Investigation - as the remedy for the GDA operable unit of the Allied Chemical/Ironton Coke site. The selected remedy is protective of human health and the environment, attains ARAR, and provides the best balance among the nine evaluation criteria. This remedy provides for isolation and containment of the GDA waste pit and the majority of the NAPS layer to eliminate future ground water contamination. A supplemental RI/FS for the NAPS layer will also be conducted as part of the remedy. This remedy also provides for extraction and treatment of the contaminated ground water until the aquifer is restored to the cleanup standards outlined in Table 7. The most important ground water cleanup standards are the benzene MCL of 5 ppb and the PAH lowest achievable detection limit of .005 ppb (PAH 10.6 cancer risk level is .0031 ppb). The risk level attained by the selected remedy is equal to the risk levels attained by alternatives 3 and 4 because the risk from GDA is associated with contaminated ground water.

The benzene and PAH ground water cleanup standards may not be technically feasible to achieve, especially in the most heavily contaminated area near the site. The ability to achieve the cleanup levels can best be evaluated using data from the operating extraction and treatment system. Therefore, ground water cleanup standards will be evaluated every five (5) years throughout the remedial action. The ground water compliance boundary is the edge of the GDA waste pit, just outside the containment system.

X. Documentation of No Significant Changes

U.S. EPA identified Alternative 2 as its preferred alternative in the Proposed Plan for the GDA Operable Unit. U.S. EPA has selected Alternative 2 as the remedy for the GDA Operable Unit. No significant changes have occurred from the preferred alternative to the selected remedy for the GDA.

XI. Statutory Determinations

The selected remedy is protective of human health and the environment; attains ARARs (unless later U.S. EPA determines certain ground water cleanup standards are not technically feasible), is cost effective; utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and uses treatment that reduces the toxicity, mobility, or volume of contaminants as a principal element.

The following is a summary of how the selected remedy meets each of the five (5) requirements.

- A. Protection of Human Health and the Environment: The selected remedy will provide protection of human health and the environment by a combination of treatment, engineered containment, and institutional controls. The GDA is a source of ground water contamination. Contaminated ground water has migrated from the GDA to the Ironton Iron Inc., and to the Ohio River. The selected remedy will stop future ground water contamination by isolating and containing the primary source, the GDA waste pit, and the majority of the secondary source, the NAPS layer. A supplemental RI/FS will be conducted for the NAPS layer. The existing ground water contamination reaching the Ironton Iron Inc. production wells and the Ohio River will be treated by the ground water extraction and treatment system. Ironton Iron Inc. will be provided a municipal water hook-up for in-plant sanitary and potable uses until ground water at Ironton Iron reaches the ground water cleanup standards. Deed restrictions will be placed on the property to limit future uses. The remedy will not pose unacceptable short-term risks and will not cause cross-media contamination.
- B. Attainment of the Applicable or Relevant and Appropriate Requirements: The selected remedy will attain Federal and State ARARs. However, the ground water cleanup ARARs and TBCs may or may not be technically feasible to attain. At this time, it is not possible to judge whether or not the ground water cleanup standards are technically feasible to attain or what other standard might be technically feasible to attain. Such a judgement is possible only after analysis of data collected during operation of the treatment system. Therefore, an ARAR waiver is not appropriate at this time. However, U.S. EPA acknowledges that an ARAR waiver may be appropriate in the future if technical infeasibility of attaining the ground water clean up standards is demonstrated. The ground water cleanup standards listed in Table 7 are the goals for this action. The technical feasibility of attaining the ground water will be evaluated every five (5) years throughout the remedial action.

The following is a list of ARARs and TBCs for the selected remedy.

Chemical Specific ARARs and TBCs

- 1) MCL for Benzene and Trichloroethylene of 5 ppb promulgated under Safe Drinking Water Act. [Relevant and Appropriate]
- 2) Ambient Water Quality Criteria of 0.5 ppm Ammonia, 0.2 ppm Cyanide, 3.5 ppm Phenol, 0.69 ppm Naphthalene based on Clean Water Act. [TBCs]
- 3) 10^{-6} health based level (ambient water quality criteria) of 0.0031 ppb or lowest achievable detection limit, currently 0.005 ppb, whichever is greater, for PAHs (benzo(a)pyrene is indicator).

Action Specific

- 1) 40 CFR 264.310 - RCRA landfill closure requirements and post closure care. [Relevant and Appropriate]
- 2) 40 CFR 264.116 and .117 - RCRA land use restriction after closure. [Relevant and Appropriate]
- 3) 40 CFR 264.92-99 - RCRA ground water monitoring substantive requirements only. [Relevant and Appropriate]
- 4) 40 CFR 262 and 263 - RCRA generator and transporter regulations for transport of spent carbon if it a hazardous waste. [Applicable]
- 5) DOT Transport Regulations 49 CFR 171-173, 177, and 178 if naturally occurring radioactive material on spent carbon exceeds limits. [Applicable]
- 6) Ohio Regulations for Naturally Occurring Radioactive Materials OAC 3701-70, 71, and 38 if lead-210 concentrations on spent carbon exceed limits. [Applicable]
- 7) OAC 3745-31-05 (A) & (B), Water Pollution Control Antidegradation Policy. [Applicable]
- 8) OAC 3745-31-05 (A) (3) Water Pollution Control Permits to Install requiring use of Best Available Technology for any new source of pollution. [Applicable]
- 9) OAC 3745-33-04 & 05 (a)(6), (8), (9) Water Pollution Control covering substantive requirements for NPDES regulated discharges. [Relevant and Appropriate]

- 10) CAC 3745-15-07 Air Pollution Control Fugitive Dust Regulations. [Applicable]
- 11) CAC 3745-81 through 99 Public Water Supply regulations. [Applicable]
- 12) CAC 3745-53-11 Hazardous Waste Transport requiring registration with PUCO. [Applicable]
- 13) CAC 3745-17-08 and 05 Air Pollution Control Fugitive Dust Regulations. [Applicable]
- 14) CERCLA Section 121(d)(3) regulating off-site treatment and disposal of hazardous CERCLA wastes. [Applicable]
- 15) CERCLA Off-site Policy addressing off-site treatment and disposal of hazardous CERCLA wastes. [Relevant and Appropriate]

C. Cost Effectiveness: The selected remedy is cost effective. It is protective of public health and the environment, attains ARARs, and offers advantages in terms of short-term effectiveness and implementability. The selected remedy is effective in the long-term with proper operation and maintenance. The selected remedy also provides permanent treatment which reduces the toxicity, mobility, or volume of contaminants for a principal threat at the GDA, contaminated ground water. Alternative 3 offers a greater degree of permanence and reduction in the toxicity, mobility, or volume of contaminants from the GDA waste pit itself. However, these advantages are off-set by the need for long-term management of the containment system, and are not commensurate with the cost of the alternative. Alternative 4 offers the greatest degree of permanence and reduction in the toxicity, mobility, or volume of contaminants but overall is cost prohibitive. Comparing the additional costs involved and advantages/disadvantages of Alternatives 3 and 4, Alternative 2 appears to be the most cost effective.

D. Utilization of Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Practicable: The selected remedy is protective of human health and the environment, attains ARARs, and is cost effective. It also offers the best balance of the remaining seven evaluation criteria. The selected remedy offers advantages over Alternatives 3 and 4 in terms of short-term effectiveness, implementability, and cost. The long-term effectiveness of the selected remedy is ensured by a well designed, maintained, and monitored containment system. The selected remedy also provides permanent treatment which reduces the toxicity, mobility, or volume of contaminants for a principal threat at the GDA, contaminated ground water. The community and the State accept the selected remedy. Alternative 3 is much more costly, is more difficult to implement, presents potential short-

term risks to on-site workers and the community and takes longer to implement. It also requires long-term management of the necessary containment system as with Alternative 2. Alternative 3 does offer a greater degree of permanence and reduction of the toxicity, mobility, and volume of contaminants but these advantages are not commensurate with the costs. The State would accept this alternative. The community did not comment on it. Alternative 4 is the most costly, most difficult to implement, presents potential short-term risks to on-site workers and the community, and takes the longest to implement. It eliminates the need for long-term management and provides the greatest degree of permanence and reduction in the toxicity, mobility, or volume of contaminants. The State does not accept this alternative. The community did not comment on it.

- E. Preference for Treatment as a Principal Element: Portions of the selected remedy satisfy the statutory preference for treatment as a principal element because it uses treatment to permanently and significantly reduce the toxicity, mobility or volume of contaminants for a principal threat at the GDA, the contaminated ground water. Another threat, the waste pit itself, is contained rather than treated. Because of the disposal area size; the fact that there are no on-site hot spots (discrete areas of highly contaminated material) representing major sources of contamination; the difficulties in implementing an excavation and treatment remedy; and the high cost of incineration, it is not practicable to excavate and treat the disposal area.

RESPONSIVENESS SUMMARY

U.S. EPA received three written public comments on the Proposed Plan and Feasibility Study for the Goldcamp Disposal Area Operable Unit of the Allied Chemical/Ironton Coke site. In addition, no oral public comments were offered during the comment period of the public meeting. The three written public comments are summarized and responded to below.

Comment 1:

AMCAST Industrial Corporation requested a 90-day extension of the public comment period on September 2, 1988. On September 15, 1988, AMCAST again requested additional time to submit additional comments. AMCAST asserted that the additional time was required because they did not receive individual notice of the Proposed Plan and preferred alternative until August 17, 1988, and did not receive a copy of the site documents from Allied until August 30, 1988.

Response:

U.S. EPA followed all statutory and regulatory requirements of Section 113(k) and 117(a) of CERCLA and Section 300.67 of Title 40 of the CFR for notifying the public of our proposed action at the Goldcamp Disposal Area. Pursuant to Section 113(k) and 117(a) of CERCLA, U.S. EPA provided the public, and thereby also AMCAST, notice of its Proposed Plan, the starting and ending date of the public comment period, the date of the public meeting, the location of the repositories where the site documents could be reviewed and the name of the U.S. EPA contact person in a newspaper notice published on August 2, 1988, in the Ironton Tribune newspaper. The comment period was in excess of the 21-day minimum suggested by 40 CFR 300.67. At no time during the comment period did the U.S. EPA receive from the commenter a request for copies of the "site documents" contained in the Administrative Record. The Goldcamp Disposal Area Administrative Record was available for review at the information repository in Ironton, Ohio and in the Regional office for the full 30-day public comment period. The letter AMCAST received on August 17, 1988, was a "Special Notice" letter required under Section 122(e). It was not required to satisfy the public participation requirements of Sections 113(k) and 117(a) of CERCLA. In a letter dated September 9, 1988, U.S. EPA denied the request for extension of the public comment period but indicated that it would try to consider, to the extent possible, any comments received after the close of the comment period. Presented below is U.S. EPA's response to the one late comment received to date. U.S. EPA does not believe that additional time is necessary given the time already provided to the public.

Comment 2:

AMCAST Industrial Corporation submitted a comment letter dated September 15, 1988 (comment period closed September 6, 1988). AMCAST commented that it's preliminary review of the site data indicates safe ground water cleanup levels may be achieved in a shorter period of time than the 30-year time period estimated by the Agency. AMCAST expressed concern that if the Agency's estimate is excessive, the cost of the preferred alternative is unreasonably increased.

Response

AMCAST did not provide any support for its assertion that the groundwater cleanup can be achieved faster than presently estimated. U.S. EPA does not believe the ground water cleanup time period estimates contained in the Proposed Plan and the Feasibility Study are excessive. The time to achieve the ground water cleanup standards is dependent on where cleanup performance is measured. Ground water at the nearest receptor, Ironton Iron Inc., will take an estimated 5 years to cleanup to ARARs level. Ground water near the site (compliance point located just outside the waste pit) will take an estimated 25 additional years to achieve. It will take longer to achieve the ground water cleanup levels near the site for several reasons: 1) ground water near the site contains high levels of contamination; and 2) the ground water "safe" cleanup levels are low, such as 5 parts per billion Benzene and 5 parts per trillion Polynuclear Aromatic Hydrocarbons. U.S. EPA recognizes that the actual time to achieve the ground water cleanup levels near the site may be shorter or longer than the estimated 30-year time period, but believes this estimation is reasonable.

The cost associated with the estimated ground water cleanup period does not impact U.S. EPA's evaluation of the cleanup alternatives because the ground water cleanup cost is the same for all alternatives, except the no action alternative. Furthermore, the ground water cleanup is performance based, and will continue until the cleanup levels have been reached, whether it takes more or less time than that estimated in the Feasibility Study.

Comment 3:

The Department of Interior informed U.S. EPA by letter that it was not interested in participating in GDA negotiations as a Natural Resource Trustee under Superfund. In that letter, the Department of Interior also provided comments on the Proposed Plan. The Department of Interior (DOI) commented that it believes, in general, U.S. EPA's planning process for the long-term sequestration of hazardous wastes is flawed. It commented that it has never seen an EPA Superfund design that attempted to determine how long waste would remain hazardous or tried to design containment for such a long period of time. DOI asserted that the major advantage of the selected alternative is cost, and without reviewing the cost assumptions, asserted that future operation and maintenance of the

preferred alternative will meet or exceed the cost of the most expensive alternative. DOI also raised concern about the source of money for continued long-term operation and maintenance, and the future environmental consequences if long-term operation and maintenance is not conducted.

Response:

U.S. EPA recognizes DOI's concern about the long-term disposition of hazardous wastes, as such concern is not a new issue for this Agency. However, we respectfully disagree with DOI that the major advantage of the preferred alternative is cost and that it does not adequately provide for long-term protection of human health and the environment. U.S. EPA must examine a number of criteria when evaluating remedial alternatives. As we stated in the Proposed Plan, the preferred alternative provides the best balance among the many evaluation criteria, of which cost is only one. The slurry wall and cap will be designed to be compatible with the wastes, thereby minimizing the potential migration of contaminants from it. The structural and chemical integrity of these systems will be monitored, with the PRPs required to replace, repair, or modify them if the monitoring indicates that they no longer adequately protect human health and the environment. Finally, the groundwater systems will be designed to ensure that the groundwater meets environmentally acceptable levels.

DOI's concern about long-term operation and maintenance is well taken. The long-term operation and maintenance of the preferred alternative will be ensured by the potentially responsible parties through a funding mechanism in the Consent Decree. This funding mechanism will provide for future repair/replacement of the containment system, as needed.

APPENDIX A

Table A-1
Alternative 2
Cap/Sl.Wall with Inside & Outside Extraction Wells/Treatment System

Capital Cost				
Description	Units	Quantity	\$/unit	Installed Cost
1-MOBILIZATION				\$65,000
2-SLURRY WALL				
Soil/Bentonite	sq. ft.	165600	\$8.00	\$1,324,800
Health & Safety Measures				\$80,000
Sub Total (Slurry Wall)				\$1,404,800
3-CAP				
2' Cover soil (6" Top Soil)	cu. yd.	18550	\$12.00	\$222,600
Geotextile	sq. yd.	27800	\$1.50	\$41,700
Hvdronet	sq. yd.	27800	\$1.50	\$41,700
60 mil HDPE liner	sq. yd.	27800	\$9.00	\$250,200
2' of Clay Liner	cu. yd.	18550	\$17.00	\$315,350
Vent System				
-6" Gravel	cu. yd.	4633	\$12.00	\$55,600
-Geotextile	sq. yd.	27800	\$1.50	\$41,700
-Carbon Canisters/Piping				\$10,000
Revegetation	sq. yd.	27800	\$0.30	\$8,340
Sub Total (Cap)				\$1,042,790
4-EXTRACTION WELLS				
Inside Wells	unit	2	\$30,000	\$60,000
Outside Well	unit	1	\$40,000	\$40,000
Pump connecting pipe	ft.	300	\$10.00	\$3,000
Transfer Pipe (4" pipe)	ft.	1500	\$15.00	\$22,500
Sub Total (Extraction Wells)				\$125,500
5-IIC PRODUCTION WELL				
Well	unit	1	\$50,000	\$50,000
Pump (400 gpm)				\$12,000
Piping (8" Pipe)	ft.	800	\$25.00	\$20,000
Sub Total (IIC Production Well)				\$82,000
6-PROPOSED MONITORING WELL (GDA)	unit	1	\$8,000	\$8,000
7-TREATMENT SYSTEM (SEE TABLE A-4)	unit	1	\$620,000	\$620,000
8-ENGINEERING (15% OF ITEMS 1 TO 7)				\$300,000
9-TRTU INVESTIGATION (SLURRY WALL)				\$150,000
10-CARBON-BLOCK STUDY WALL)				\$40,000
11-TREATABILITY STUDY				\$40,000
Sub Total (Items 1 to 11)				\$4,080,304
12-Construction administration (5% Items 1 to 11)				\$204,015
13-CONTINGENCY (15% Items 1 to 11)				\$612,046
Total (Items 1 to 13)				\$4,896,364
Total Capital Cost				\$4,900,000

Base Annual Operating Costs			\$/yr.
Description	Units	Quantity	\$/yr.
1-MONITORING AND STATISTICAL ANALYSIS			\$35,000
2-OPERATION AND MAINTENANCE	unit	1	\$50,000
3-REPAIRS (O & M)	unit	1	\$7,000
4-REPAIRS (SEE TABLE A-4)	unit	1	\$300,000
5-ANNUAL RE-EVALUATION (2)			\$40,000
Sub Total (Items 1 to 5)			\$446,000
6-CONTINGENCY AT 15%			\$66,900
Total (Items 1 to 6)			\$512,900
Total Base Annual Operating			\$515,000



Table A-1
(Continue)
Alternative 2

Cost Summary

Capital Cost \$	Present Worth Annual Operating \$ (b)	Present Worth \$
----- 4,500,000	----- 8,330,000	----- 13,130,000 (c)

- (a) \$620,000 at the end of every 5 years, prorated over 5 years using
Straight-Line Depreciation Method.
(b) Present Worth For Annual Operating Costs From Table A-3
(c) For additional assumptions see Notes 1 and 2 of Appendix A-9

Table A-2
Alternative 3
GDA Waste Incineration/Sl. Wall with Extraction Wells/Treatment System
Capital Cost

Description	Units	Quantity	\$/unit	Installed
1-MOBILIZATION				\$60,000
2-RETAINING STRUCTURE				
Reinforced Concrete	sq. ft.	84000	\$50.00	\$4,200,000
Tie Back	unit	420	\$1,785	\$749,700
Sub Total (Retaining Structure)				\$4,949,700
3-ASH INTERIM STORAGE AREA				
Excavation	cu. yd.	63000	\$7.00	\$441,000
Dike Compaction	cu. yd.	63000	\$3.00	\$189,000
60 Mil HDPE Liner	sq. yd.	103333	\$9.00	\$930,000
Surface Water Collection	ft.	3400	\$4.00	\$13,600
Sub Total (Ash Interim Storage)				\$1573600
4-SOIL STAGING AREA	sq. ft.	4000	\$20.00	\$80,000
5-EXTRACTION WELLS				
Inside Wells	unit	2	\$30,000	\$60,000
Outside Well	unit	1	\$40,000	\$40,000
Pump Connecting Pipes	ft.	300	\$10.00	\$3,000
Transfer Pipes (4" & 1" pipes)	ft.	1500	\$15.00	\$22,500
Sub Total (Extraction Wells)				\$125,500
6-IIC PRODUCTION WELL				
Well	unit	1	\$50,000	\$50,000
Pump (400 gpm)	unit	1	\$12,000	\$12,000
Piping (8" Pipe)	ft.	800	\$25.00	\$20,000
Sub Total (IIC Production Well)				\$82,000
7-PROPOSED MONITORING WELL (GDA)		1	\$8,000	\$8,000
8-TREATMENT SYSTEM (SEE TABLE A-4)		1	\$620,000	\$620,000
9-ENGINEERING (15% OF ITEM 1 TO 8)				\$1,124,820
10-FIELD INVESTIGATION (SLURRY WALL)				\$1,124,820
11-LABORATORY (SLURRY WALL)				\$1,124,820
12-TREATABILITY STUDY				\$40,000
13-MONITORING WELLS (ASH INTERIM STORAGE AREA)	unit	3	\$8,000	\$24,000
Sub Total (Items 1 to 13)				\$8,877,620
14-CONSTRUCTION ADMINISTRATION (5% items 1 to 13)				\$443,881
15-Contingency (15% of Items 1 to 13)				\$1,331,643
Total (Items 1 to 15)				\$10,653,144
Total Capital Cost				\$10,653,000

Base Annual Operating Costs

			\$/yr.
1-MONITORING AND STATISTICAL ANALYSIS			\$52,000
2-EXTRACTION WELLS (O & M)	unit	3 \$7,000	\$21,000
3-TREATMENT SYSTEM (SEE TABLE A-4)	unit	1 \$300,000	\$300,000
4-FIVE-YEAR REEVALUATION (a)	unit	1 \$40,000	\$40,000
Sub Total (Items 1 to 4)			\$413,000
5-CONTINGENCY AT 15% OF SUB TOTAL			\$61,950
TOTAL (Items 1 to 5)			\$474,950
Total Base Annual Operating Cost			\$474,950

Table A-2
(Continue)
Alternative 3

Cost Summary

Capital Cost \$	Present Worth Annual Operating \$ (b)	Present Worth \$
----- 10,650,000	----- 81,580,000	----- 92,230,000 (c)

- (a) \$800,000 at the end of every 5 years, prorated over 5 years using Straight Line Depreciation Method.
(b) Present Worth for Annual Operating Costs From Table A-6
(c) For additional assumptions see Notes 1 and 2 of Appendix A-9

Table A-3
Alternative 4
GDA Waste And Subsoils Incineration With Outside Well/Treatment System
and Ash Off-site Disposal

Capital Cost

Description	Units	Quantity	\$/unit	Installed
1-MOBILIZATION				\$300,000
2-RETAINING STRUCTURE				
Double Wall Excav.	cu. vd.	127407	\$15.00	\$1,911,111
Double Wall Structure	sq. ft.	172000	\$90.00	\$15,480,000
Double Wall Backfill. (Include Borrow Soil)	cu. yd.	127407	\$25.00	\$3,185,185
Sub Total (Retaining Structure)				\$20,576,296
3-SOIL STAGING AREA	sq. ft.	4000	\$20.00	\$80,000
4-EXTRACTION WELL				
Outside Well	unit	1	\$40,000	\$40,000
Pump Connecting Pipes	ft.	100	\$10.00	\$1,000
Transfer Pipe (4" pipe)	ft.	900	\$15.00	\$13,500
Sub Total (Extraction Wells)				\$54,500
5-IIC PRODUCTION WELL				
Well		1	\$50,000	\$50,000
Pump (400 gpm)				\$12,000
Piping (8" pipe)	ft.	800	\$25.00	\$20,000
Sub Total (IIC Production Well)				\$82,000
6-DEWATERING				
Pump (200 gpm)	unit	4	\$20,000	\$80,000
Misc./Piping				\$80,000
Sub Total (Dewatering)				\$160,000
7-TREATMENT SYSTEM (SEE TABLE A-4)		1	\$620,000	\$620,000
8-INCINERATING (15% ITEMS 1 TO 5)				\$3,310,919
9-TREATABILITY STUDY				\$40,000
Sub Total (Items 1 to 9)				\$25,423,716
10-CONSTRUCTION ADMINISTRATION (5% Items 1 to 9)				\$1,271,186
11-CONTINGENCY (15% Items 1 to 9)				\$3,813,557
Total (Items 1 to 11)				\$30,508,459
Total Capital Cost				\$30,500,000

Base Annual Operating Cost

			\$/yr.
1-MONITORING AND STATISTICAL ANALYSIS			\$35,000
2-OUTSIDE WELL	unit	1	\$10,000
3-TREATMENT SYSTEM (SEE TABLE A-4)			\$300,000
4-FIVE-YEAR REEVALUATION (a)	unit	1	\$40,000
Sub Total (Items 1 to 4)			\$385,000
5-CONTINGENCY (15% Items 1 to 4)			\$57,750
Total (Items 1 to 5)			\$442,750
Total Base Annual Operating Cost			\$440,000

Table A-3
(Continue)
Alternative 4

Cost Summary

Capital Cost \$	Present Worth Annual Operating \$ (b)	Present Worth \$
----- 30,500,000	----- 187,500,000	----- 218,000,000 (c)

- (a) \$200,000 at the end of every 5 years, prorated over 5 years using Straight Line Depreciation Method.
(b) Present Worth For Annual Operating Costs From Table A-7
(c) For additional assumptions see Notes 1 and 2 of Appendix A-9

Table A-4
Ground Water Treatment System with Activated Carbon

Capital Cost

Description	Units	Quantity	\$/unit	Uninstalled Cost
1-Equalization Tank (2,000 gal)	vessel	1	\$2,000	\$2,000
2-Activated Carbon	unit	1	\$150,000	\$150,000
3-Dual Media Filter	unit	1	\$20,000	\$20,000
4-Filter Back Wash Tank (10,000 gal)	vessel	1	\$10,000	\$10,000
5-Pumps				
1,000 gpm (Back Wash)	unit	1	\$6,000	\$6,000
100 gpm, TDH=120 ft	unit	3	\$2,500	\$7,500
100 gpm, TDH=150 ft	unit	2	\$2,500	\$5,000
Sub Total (Items 1 to 5)				\$200,500
6-Installation for Activated Carbon				\$50,000
7-Installation at 200% of Equip. Cost (exc. act. Carbon)				\$101,000
8-Piping & Electrical at 30% Sub Total 1&Installation Costs				\$105,450
9-Instrument and Site Preparation at 10% Sub Total 1				\$20,050
10-Building (2600 sq. ft at \$55/sq. ft)				\$143,000
Total Capital Cost				=====
				\$620,000
				=====

Annual Operating Costs

				\$/yr.
1-Activated Carbon	Pound	168000	\$1	\$168,000
2-Waste Activated Carbon Disposal	Ton	84	\$200	\$16,800
3-Labor (8 hr/day, 365 day/yr)	Hour	2920	\$25	\$73,000
4-Maintenance				\$30,000
5-Analytical				\$10,000
Sub Total (Items 1 to 5)				=====
				\$297,800
				=====
Total Annual Operating Cost				\$300,000

Table A-5
Present Worth
Alternative 2's Annual Operating Costs

YEAR	BASE ANNUAL COST (\$10000)	COST/YR WATER SUPPLY, \$/yr	ANNUAL COST \$/yr	INFLATION AT \$/yr	PRESENT WORTH FACTOR AT 10%	PRESENT WORTH \$
1	0	8.00	8.00	1.00	1.0000	8.00
2	0	8.00	8.00	1.08	0.9259	7.41
3	0	8.00	8.00	1.17	0.8573	6.86
4	0	8.00	8.00	1.26	0.7938	6.35
5	0	8.00	8.00	1.36	0.7350	5.88
6	0	8.00	8.00	1.46	0.6813	5.45
7	0	8.00	8.00	1.57	0.6323	5.06
8	0	8.00	8.00	1.68	0.5880	4.71
9	0	8.00	8.00	1.80	0.5477	4.39
10	0	8.00	8.00	1.93	0.5114	4.10
11	0	8.00	8.00	2.07	0.4788	3.83
12	0	8.00	8.00	2.22	0.4488	3.59
13	0	8.00	8.00	2.38	0.4212	3.37
14	0	8.00	8.00	2.55	0.3960	3.17
15	0	8.00	8.00	2.73	0.3730	2.99
16	0	8.00	8.00	2.93	0.3520	2.83
17	0	8.00	8.00	3.14	0.3328	2.68
18	0	8.00	8.00	3.37	0.3153	2.55
19	0	8.00	8.00	3.61	0.2994	2.43
20	0	8.00	8.00	3.87	0.2850	2.32
21	0	8.00	8.00	4.15	0.2720	2.22
22	0	8.00	8.00	4.45	0.2603	2.13
23	0	8.00	8.00	4.77	0.2497	2.05
24	0	8.00	8.00	5.11	0.2401	1.97
25	0	8.00	8.00	5.48	0.2314	1.90
26	0	8.00	8.00	5.87	0.2236	1.83
27	0	8.00	8.00	6.29	0.2165	1.77
28	0	8.00	8.00	6.74	0.2101	1.71
29	0	8.00	8.00	7.21	0.2043	1.66
30	0	8.00	8.00	7.71	0.1990	1.61
31	0	8.00	8.00	8.24	0.1941	1.56
32	0	8.00	8.00	8.79	0.1896	1.52
33	0	8.00	8.00	9.37	0.1854	1.48
34	0	8.00	8.00	9.98	0.1815	1.44
35	0	8.00	8.00	10.62	0.1778	1.41
36	0	8.00	8.00	11.29	0.1743	1.38
37	0	8.00	8.00	12.00	0.1710	1.35
38	0	8.00	8.00	12.74	0.1679	1.32
39	0	8.00	8.00	13.52	0.1649	1.30
40	0	8.00	8.00	14.34	0.1620	1.27
41	0	8.00	8.00	15.19	0.1593	1.25
42	0	8.00	8.00	16.08	0.1567	1.23
43	0	8.00	8.00	16.99	0.1542	1.21
44	0	8.00	8.00	17.94	0.1518	1.19
45	0	8.00	8.00	18.93	0.1495	1.17
46	0	8.00	8.00	19.95	0.1473	1.15
47	0	8.00	8.00	21.01	0.1451	1.14
48	0	8.00	8.00	22.11	0.1430	1.12
49	0	8.00	8.00	23.25	0.1410	1.11
50	0	8.00	8.00	24.43	0.1390	1.10
51	0	8.00	8.00	25.66	0.1371	1.09
52	0	8.00	8.00	26.93	0.1352	1.08
53	0	8.00	8.00	28.25	0.1334	1.07
54	0	8.00	8.00	29.61	0.1316	1.06
55	0	8.00	8.00	31.02	0.1299	1.05
56	0	8.00	8.00	32.48	0.1282	1.04
57	0	8.00	8.00	33.99	0.1266	1.03
58	0	8.00	8.00	35.55	0.1250	1.02
59	0	8.00	8.00	37.16	0.1234	1.01
60	0	8.00	8.00	38.83	0.1219	1.00
61	0	8.00	8.00	40.55	0.1204	0.99
62	0	8.00	8.00	42.33	0.1189	0.98
63	0	8.00	8.00	44.17	0.1175	0.97
64	0	8.00	8.00	46.07	0.1161	0.96
65	0	8.00	8.00	48.03	0.1147	0.95
66	0	8.00	8.00	50.05	0.1134	0.94
67	0	8.00	8.00	52.14	0.1121	0.93
68	0	8.00	8.00	54.29	0.1108	0.92
69	0	8.00	8.00	56.51	0.1096	0.91
70	0	8.00	8.00	58.80	0.1084	0.90
71	0	8.00	8.00	61.16	0.1072	0.89
72	0	8.00	8.00	63.60	0.1060	0.88
73	0	8.00	8.00	66.11	0.1049	0.87
74	0	8.00	8.00	68.70	0.1038	0.86
75	0	8.00	8.00	71.37	0.1027	0.85
76	0	8.00	8.00	74.12	0.1016	0.84
77	0	8.00	8.00	76.95	0.1006	0.83
78	0	8.00	8.00	79.87	0.0996	0.82
79	0	8.00	8.00	82.88	0.0986	0.81
80	0	8.00	8.00	85.98	0.0976	0.80
81	0	8.00	8.00	89.17	0.0967	0.79
82	0	8.00	8.00	92.46	0.0958	0.78
83	0	8.00	8.00	95.85	0.0949	0.77
84	0	8.00	8.00	99.34	0.0940	0.76
85	0	8.00	8.00	102.94	0.0932	0.75
86	0	8.00	8.00	106.64	0.0924	0.74
87	0	8.00	8.00	110.45	0.0916	0.73
88	0	8.00	8.00	114.37	0.0908	0.72
89	0	8.00	8.00	118.40	0.0900	0.71
90	0	8.00	8.00	122.55	0.0893	0.70
91	0	8.00	8.00	126.82	0.0886	0.69
92	0	8.00	8.00	131.21	0.0879	0.68
93	0	8.00	8.00	135.73	0.0872	0.67
94	0	8.00	8.00	140.37	0.0865	0.66
95	0	8.00	8.00	145.14	0.0859	0.65
96	0	8.00	8.00	150.04	0.0852	0.64
97	0	8.00	8.00	155.07	0.0846	0.63
98	0	8.00	8.00	160.24	0.0840	0.62
99	0	8.00	8.00	165.55	0.0834	0.61
100	0	8.00	8.00	171.00	0.0828	0.60
101	0	8.00	8.00	176.60	0.0822	0.59
102	0	8.00	8.00	182.34	0.0816	0.58
103	0	8.00	8.00	188.23	0.0811	0.57
104	0	8.00	8.00	194.27	0.0806	0.56
105	0	8.00	8.00	200.47	0.0801	0.55
106	0	8.00	8.00	206.83	0.0796	0.54
107	0	8.00	8.00	213.35	0.0791	0.53
108	0	8.00	8.00	220.04	0.0786	0.52
109	0	8.00	8.00	226.90	0.0781	0.51
110	0	8.00	8.00	233.94	0.0776	0.50
111	0	8.00	8.00	241.16	0.0772	0.49
112	0	8.00	8.00	248.57	0.0767	0.48
113	0	8.00	8.00	256.17	0.0763	0.47
114	0	8.00	8.00	263.97	0.0759	0.46
115	0	8.00	8.00	271.97	0.0755	0.45
116	0	8.00	8.00	280.18	0.0751	0.44
117	0	8.00	8.00	288.59	0.0747	0.43
118	0	8.00	8.00	297.21	0.0743	0.42
119	0	8.00	8.00	306.04	0.0740	0.41
120	0	8.00	8.00	315.09	0.0736	0.40
121	0	8.00	8.00	324.36	0.0733	0.39
122	0	8.00	8.00	333.85	0.0729	0.38
123	0	8.00	8.00	343.57	0.0726	0.37
124	0	8.00	8.00	353.52	0.0723	0.36
125	0	8.00	8.00	363.71	0.0720	0.35
126	0	8.00	8.00	374.14	0.0717	0.34
127	0	8.00	8.00	384.82	0.0714	0.33
128	0	8.00	8.00	395.75	0.0711	0.32
129	0	8.00	8.00	406.94	0.0708	0.31
130	0	8.00	8.00	418.39	0.0705	0.30
131	0	8.00	8.00	429.11	0.0702	0.29
132	0	8.00	8.00	440.11	0.0700	0.28
133	0	8.00	8.00	451.39	0.0697	0.27
134	0	8.00	8.00	462.96	0.0694	0.26
135	0	8.00	8.00	474.82	0.0692	0.25
136	0	8.00	8.00	486.98	0.0689	0.24
137	0	8.00	8.00	499.44	0.0687	0.23
138	0	8.00	8.00	512.21	0.0684	0.22
139	0	8.00	8.00	525.29	0.0682	0.21
140	0	8.00	8.00	538.68	0.0680	0.20
141	0	8.00	8.00	552.39	0.0677	0.19
142	0	8.00	8.00	566.42	0.0675	0.18
143	0	8.00	8.00	580.78	0.0673	0.17
144	0	8.00	8.00	595.47	0.0671	0.16
145	0	8.00	8.00	610.50	0.0669	0.15
146	0	8.00	8.00	625.88	0.0667	0.14
147	0	8.00	8.00	641.62	0.0665	0.13
148	0	8.00	8.00	657.74	0.0663	0.12
149	0	8.00	8.00	674.24	0.0661	0.11
150	0	8.00	8.00	691.14	0.0659	0.10
151	0	8.00	8.00	708.45	0.0657	0.09
152	0	8.00	8.00	726.18	0.0655	0.08
153	0	8.00	8.00	744.34	0.0653	0.07
154	0	8.00	8.00	762.94	0.0651	0.06
155	0	8.00	8.00	781.99	0.0649	0.05
156	0	8.00	8.00	801.50	0.0647	0.04
157	0	8.00	8.00	821.48	0.0645	0.03
158	0	8.00	8.00	841.94	0.0643	0.02
159	0	8.00	8.00	862.89	0.0641	0.01
160	0	8.00	8.00	884.34	0.0639	0.00
161	0	8.00	8.00	906.30	0.0637	0.00
162	0	8.00	8.00	928.78	0.0635	0.00
163	0	8.00	8.00	951.79	0.0633	0.00
164	0	8.00	8.00	975.34	0.0631	0.00
165	0	8.00	8.00	999.44	0.0629	0.00
166	0	8.00	8.00	1024.10	0.0627	0.00
167	0	8.00	8.00	1049.33	0.0625	0.00
168	0	8.00	8.00	1075.15	0.0623	0.00
169	0	8.00	8.00	1101.57	0.0621	0.00
170	0	8.00	8.00	1128.61	0.0619	0.00
171	0	8.00	8.00	1156.28	0.0617	0.00
172	0	8.00	8.00	1184.60	0.0615	0.00
173	0	8.00	8.00	1213.59	0.0613	0.00
174	0	8.00	8.00	1243.27	0.0611	0.00
175	0	8.00	8.00	1273.66	0.0609	0.00
176	0	8.00	8.00	1304.78	0.0607	0.00
177	0	8.00	8.00	1336.65	0.0605	0.00
178	0	8.00	8.00	1369.29	0.0603	0.00
179	0	8.00	8.00	1402.72	0.0601	0.00
180	0	8.00	8.00	1436.97	0.0599	0.00
181	0	8.00	8.00	1472.06	0.0597	0.00
182	0	8.00	8.00	1507.01	0.0595	0.00
183	0	8.00				

Table A
Present with
Alternative J's Annual Operating Costs

YEAR	WATER SUPPLY sq. ft/yr	COST/YR at 40.3/sq. ft	COAL DEMAND (ton/annum)	COST/YR at 610/cu. yd	INCINERATION (ton/yr)	COST/YR at 4200/ton	POW. TRANS. & CIPWEL. cu. yd/yr	COST/YR at 40/cu. yd	POW. SOIL LOST cu. yd/yr	COST/YR at 85/cu. yd	POW. SOIL 610/cu. yd	COST/YR at 32/cu. yd	COST/YR at 11/cu. yd	POW. SOIL 610/cu. yd	COST/YR at 52/cu. yd	POW. SOIL 610/cu. yd	MAINTENANCE sq. ft/yr
1	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
2	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
3	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
4	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
5	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
6	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
7	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
8	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
9	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
10	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
11	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
12	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
13	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
14	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
15	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
16	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
17	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
18	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
19	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
20	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
21	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
22	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
23	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
24	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
25	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
26	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
27	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
28	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
29	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
30	200000	80000	60000	60000	7000	1000000	51000	40000	0	0	0	0	0	0	0	0	0
TOTAL	1877600	563700	300000	300000	25000	2000000	85416	67200	412000	67200	67200	67200	67200	67200	67200	67200	7200

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Table A-6
(Continue)[illegible]
$$\text{Real Present Worth} = \text{Total Annual operating Cost} \times \text{Inflation Factor} \times \text{Present Worth Factor}$$

MINIMUM CHARGES

A-7

Table A-8
Cost Summary

Alternative	Capital Cost \$	Present Worth Annual Operating \$	Present Worth \$
-----	-----	-----	-----
1	0	0	0
4	4,900,000	8,230,000	13,130,000
	10,650,000	81,580,000	92,230,000
	30,500,000	187,500,000	218,000,000

APPENDIX A-9
ISSUES FOR CONSIDERATION

In review comments received on July 15, 1988 of the final draft report and at the review meeting, on July 21 and 22, 1988, several comments were made by the U.S. EPA and the OEPA which were relatively new and were not initially of concern. During the meeting, it was agreed to acknowledge these comments within the body of the text. However, these considerations either do not materially impact the alternatives or change the comparisons of the alternatives, and because of the time constraints, it was decided not to revise the figures, schedule, and cost tables. The major items are as follows:

1. In this FS report, it is assumed that the ash produced by incineration is nonhazardous. The method of ash storage, ash disposal, and accordingly the cost would require modification, if the ash is hazardous.
2. The cost and handling of spent carbon with the presence of significant amounts of radioactive constituents is not considered.
3. Preliminary assessment indicates that it is not feasible to pump or treat the NAPS layer identified in this report. No considerations of cost or time is provided for the NAPS investigation. Such considerations will change the implementation schedule and cost for all except the "no action" alternative.

COST
REFERENCES

PEI Associates, January 1987, Underground Storage Tank Corrective Action Technologies, EPA No. 625/6-87/015.

SAIC, Handbook - Remedial Action at Waste Disposal Sites, EPA No. 625/6-85/006.

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Radian Corporation, January 1983, Draft Methodology Manual - Evaluating Cost Effectiveness of Remedial Actions at Controlled Hazardous Waste Sites.

Environmental Law Institute, September 1983, Draft Compendium of Cost of Remedial Technologies at Hazardous Waste Sites, Washington, D.C.

Rishel, H.L., T.M. Boston, C.J.-Schmidt, 1984, Costs of Remedial Response Actions at Uncontrolled Hazardous Waste Sites, Noyes Publications.



State of Ohio Environmental Protection Agency

P.O. Box 1049, 1800 WaterMark Dr.
Columbus, Ohio 43266-0149

Richard F. Celeste
Governor

October 3, 1988

RE: Lawrence County
Allied Chemical/Ironton Coke site
Goldcamp Disposal Area unit

Valdas V. Adamkus
Regional Administrator
U.S. EPA, Region V
230 S. Dearborn Street
Chicago, IL 60604

O: WMD
CC: RF
FREEMAN -

Dear Mr. Adamkus:

Ohio EPA has received and reviewed the draft Record of Decision for the referenced project. Pursuant to the terms of the Administrative Consent Order signed between the Agencies and Allied in April, 1984, Ohio EPA is hereby providing results of our review to both USEPA and Allied.

My project coordinator and your project manager have discussed factual and typographic changes to the document. I understand there was substantial agreement to the points we raised. Provided these changes are properly made, Ohio EPA believes the representation of the State acceptance portion of the ROD is accurate.

Sincerely,

Richard L. Shank, Ph.D.
Director

RLS/DCS/lz

cc: David Strayer, OCA, CO
Robert Ford, Allied-Signal Inc.
Steve Hamlin, SEOO
Mary Gade, USEPA

RECEIVED

OCT 07 1988

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OFFICE OF REGIONAL ADMINISTRATOR